7th ANNUAL CARBIDES FEATURE ISSUE

FEBRUARY, 1956

TOOLING and PRODUCTION

The Magazine of Manufacturing Management

IN THIS ISSUE

Looking Ahead in MACHINING WITH CARBIDES

•

ORGANIZATION Key to Profits

•

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•

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•

PREFORMED Carbide Parts

•

TREPANNING Unsymmetrical Workpieces

•

A New Concept in TOOL SERVICING

•

MACHINING Work-Hardened Alloy Steels

Huebner Publications, Inc.

CLEVELAND 18, OHIO

BPA

LOOK TO American FOR LEADERSHIP

IN SERVICE, RELIABILITY and QUALITY

SEE...

American's EXHIBIT BOOTH FEATURING ADVANCED PLASTIC TOOLING

Booth No. 428
ASTE INDUSTRIAL EXPOSITION
March 19-23, 1956
Chicago, Illinois

To be sure you get all of these American standard features use American drill jig bushings.

Double ground lead for easy pressing into the jig. Radius into the hole — to prevent tool hang-up, wear and breakage.
Two way undercut under the head to insure squareness to the jig.
100% concentricity inspection.
Internal ground holes to insure straightness.
Original 3-D ordering method eliminating confusing code numbers.
Patented bushings for plastic tooling.
Complete local stocks.
Send for free catalogs showing complete line.

American DRILL BUSHING CO.
5107 PACIFIC BOULEVARD, LOS ANGELES 58, CALIF.

SPECIALIZING ONLY IN DRILL JIG BUSHINGS

SUTTON OFFERS SERVICE

ON COLLETS — FEEDERS — SPECIAL TOOLS

Sudden service features your dealings with Sutton:

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SUTTON TOOL COMPANY, TP-2 MAGNOLIA ST., STURGIS, MICHIGAN

SUTTON TOOL COMPANY
TP 2 Magnolia St., Sturgis, Mich.
Please send me free copy of Sutton Collet and Feeder Catalog.

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CITY_____

SUTTON COLLETS

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Produce Finer Finishes

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Your toughest milling operation is an opportunity to prove the unusual superiority of Putnam End Mill design and manufacture. Select from over 1200 sizes and types of standard Putnam End Mills the one for your job and then watch it more than meet the challenge with faster, smoother cutting.

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Even the smallest size Reamers are Standard with L&I

The Reamer Specialists

LAVALLEE & IDE, INC.
CHICOPEE, MASS.

CIRCLE INFORM-A-GRAM KEY NO. 4

TOOLING and PRODUCTION

The Magazine of Manufacturing Management

formerly Tool-Die-Machine PROGRESS 1934-1941
TOOL & DIE JOURNAL 1941-1951

George J. Huebner, Founder

VOL. XXI—No. 11 FEBRUARY, 1956

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They have the influence that enables them to adopt the ideas and the processes which TOOLING and PRODUCTION describes in every issue AND the authority to recommend, to specify and/or to buy everything that may be needed to reduce costs, increase production or improve quality. These men for whom, each month, our editors seek out or write TOOLING and PRODUCTION'S meticulously accurate stories of "Know-How" and "Tell-How" are T & P's exclusive Cycle of Buying Influence (CBI) in their plants.

Every copy is directed to these men by name, by title and by company address. Please see our BPA verification.

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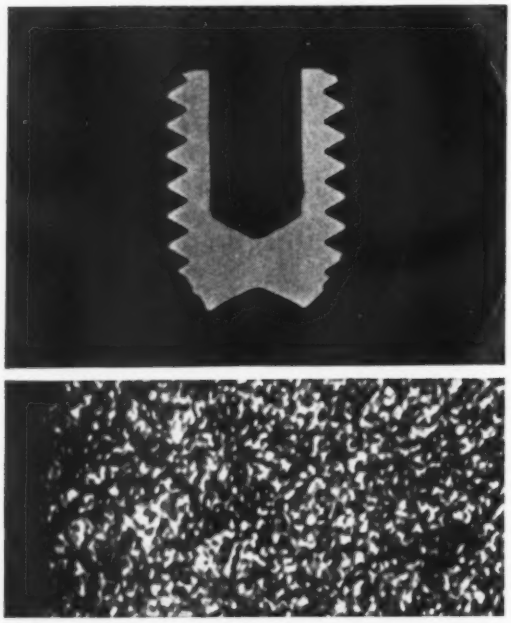
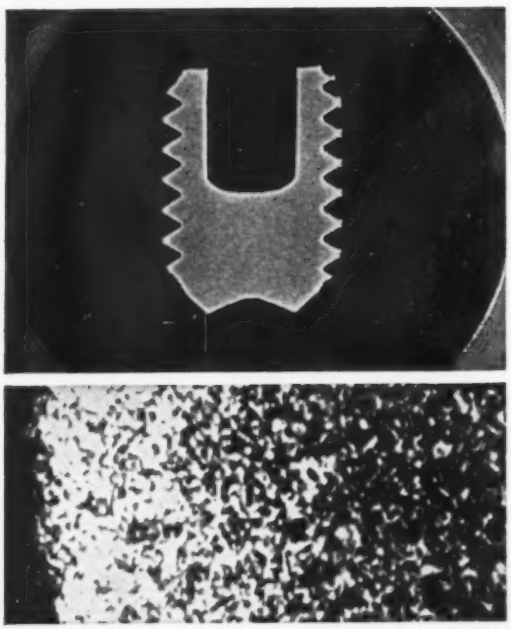
CIRCLE INFORM-A-GRAM KEY NO. 5

New heat-treatment methods help High-Torque Unbrako socket set screws withstand up to 40% Higher Torques

UNBRAKO SET SCREW



ORDINARY SET SCREW



—you can set them and forget them

Research had proved that the tighter you seat a set screw the better it works. So we developed a set screw that could be tightened tighter than ever before without damaging the screw. One of the problems was developing new methods of heat treatment to eliminate decarburization. Decarb of course plays havoc with a screw. Put a wrench in the socket and you ream it. Run the screw into a tapped hole and you strip its threads. Try to seat it and its point shears off. These photographs are a study in contrasts. The UNBRAKO is clean, its grain uniform. There is no decarburization —the ordinary set screw is suffering from an overdose of it, socket walls, threads and point are full of the telltale white spots.

You can't buy a better screw than an UNBRAKO. And you can't get full *high-torque* performance without a "High-Titan" UNBRAKO Hex Key—the high-ductility, precision internal wrenching tool. See your industrial distributor. Or write STANDARD PRESSED STEEL Co., Jenkintown 36, Pa.

RECOMMENDED SOCKET SET SCREW TIGHTENING TORQUES
(Inch-Pounds)

SCREW SIZE	UNBRAKO	SET SCREW B	SET SCREW C	MINIMUM DIFFERENTIAL %
#4	5	3.9	3.5	28
#5	9	7.8	7.4	15
#6	9	7.8	7.4	15
#8	20	14.7	14.5	36
#10	33	26.5	25	25
1/4	87	62	60	40
5/16	165	122	125	32
3/8	290	198	225	29
7/16	430	309	350	23
1/2	620	460	500	24
5/8	1225	1106	1060	11
3/4	2125	1540	1800	18
7/8	5000	3660	4600	9
1	7000	5025	6500	8

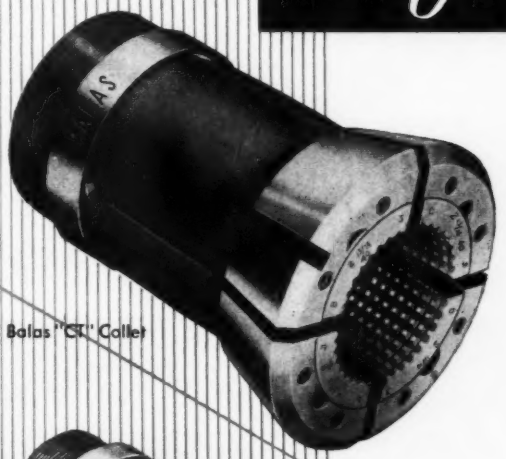
STANDARD PRESSED STEEL CO.

UNBRAKO® SOCKET SCREW DIVISION SPS

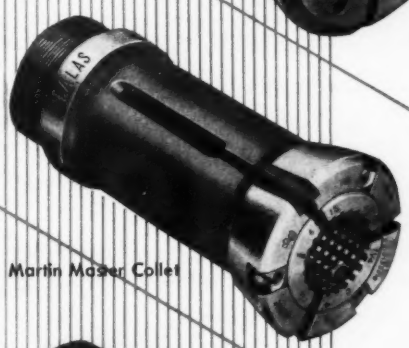
JENKINTOWN ■ PENNSYLVANIA

CIRCLE INFORM-A-GRAM KEY NO. 6

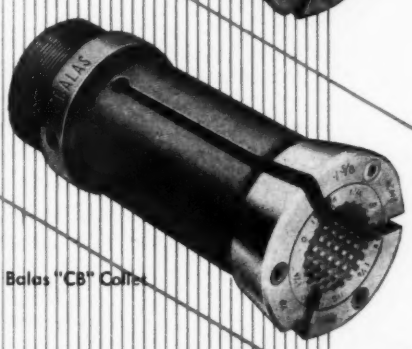
why BALAS MASTER COLLETS



Balas "CT" Collet



Martin Master Collet



Balas "CB" Collet

SAVE MONEY SAVE SET-UPS

On medium and short runs you don't need a solid collet for each size bar stock. Buy Balas Master Collets and assorted sets of pads so you can make full use of the capacity of your machines. You save money since a set of pads is about a third the cost of a solid collet of comparable capacity. Such savings mean money in your pocket.

You save time and money on set-ups, too. Balas "Martin" or "CB" Master Collet pads may be inserted into the collets without removing them from the spindle.

Balas Master Collets, because they are "cam-ground" on the taper, open and close faster, grip tighter and provide consistently accurate production. Made of specially selected alloy steel, precision manufacturing, careful heat treating and rigid inspection guarantee better production and longer life for Balas Collets.

Balas Master Collets are stocked in most sizes for all popular makes of automatics and are guaranteed against breakage for one year. They are available up to 8" capacity. Order them today and get better production at lower cost from all your machines.

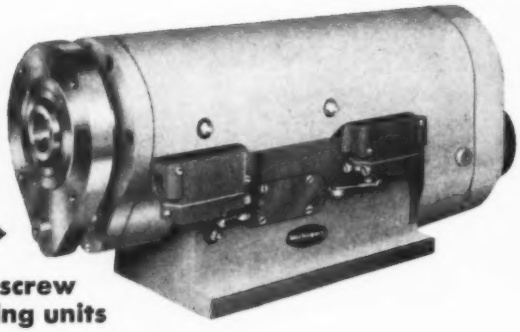
THE BALAS LINE INCLUDES: Master Collets and Pads • Pushers and Feed Fingers • Master Pushers and Pads • Ejector Collets • Conventional Collets • Carbide-faced Stock Stops for B. & S. Machines • Collet Sleeves and Chuck Nuts for B. & S. Machines

BALAS COLLET MANUFACTURING CO.

Cleveland 14, Ohio

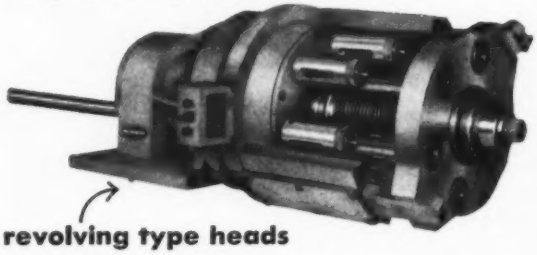
REPRESENTATIVES: George Britton, Brockport, N. Y.; Bert Lewyn, Atlanta, Georgia; L.R. Christiansen Co., Moline, Illinois; Eugene H. Cooper Co., Hopkins, Minn.; Tri-Tex Machine & Tool Co., Houston, Texas; Fuchs Machinery & Supply, Omaha, Neb.; Harris Frederic & Co., Inc., Shreveport, La.; Machine Tool & Supply Co., Tulsa, Okla.; Hoffman Baumruck Co., Philadelphia, Pa.; Hunker & Dixon, Indianapolis, Ind.; Tom Scott, South Bend and Elkhart, Ind.; Shively Bros., Inc.; Flint and Royal Oak, Mich.; Coast Tool Co., Oakland, California; Harvey A. Wolff, Milwaukee, Wisconsin; A. C. Behringer, Inc., Los Angeles, California; S.B. Martin Co., Cleveland, Ohio; Morris Machinery Co., Newark, New Jersey; Paul & Dudley, Glendale, California; John S. Pettit, Madison, Conn.; L.E. Rogers Co., Chicago, Ill.; Scott Special Tools, St. Louis, Mo.; Tool Specialists, Westbury, N.Y.; Arthur Williams, Beaverton, Oregon; Iver J. Esbensen Co., Denver, Colorado; T.M. Welborn Co., Greenville, South Carolina; The L.C. Keir Co., Seattle, Washington; State Sales & Service, Detroit, Michigan; Alexander & Orlick, Ltd., Brantford, Ontario.

CIRCLE INFORM-A-GRAM KEY NO. 7



lead screw tapping units

Single-spindle or multiple-spindle, and, plain or flange quill mounting.

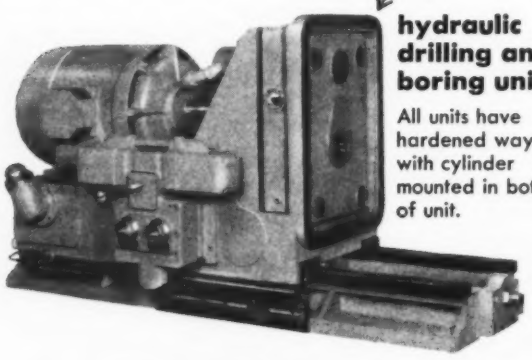


revolving type heads

Mount vertical on *any* center-column machine with rotating chuck.

hydraulic index tables

Simple design—maximum safety—completely hydraulically operated.



hydraulic drilling and boring units

All units have hardened ways, with cylinder mounted in bottom of unit.

use

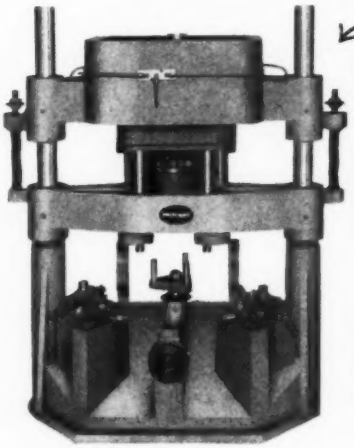
Michigan

Components

. . . For Faster, More Economical Production

Here are a few typical examples of Heads, Bushing Plates, Fixtures, Automatic Index Tables, Hydraulic Drilling and Boring Units, and, Lead Screw Tapping Units used by Machine Tool Builders and Manufacturers, who insist upon the finest, when building or re-tooling.

We also build Revolving Heads for Chucking Machines.



multiple drill heads

Adapted for any type drill press and feed units. Shown with bushing plate and fixture.

We solicit your inquiries on any of your Multiple Drilling Problems.

Michigan

DRILL HEAD CO. Detroit 34, Michigan

engineers and manufacturers of production machines and drilling equipment

CIRCLE INFORM-A-GRAM KEY NO. 8

'Standardize' on

IDEAL

LIVE CENTERS

Get the LIVE CENTERS You Need – When You Need Them – FROM STOCK

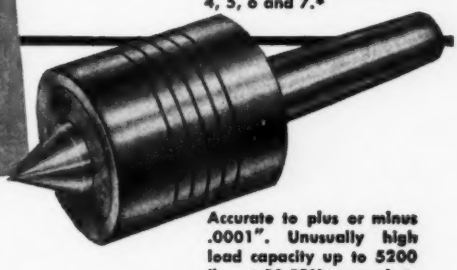
See Your IDEAL Distributor!

MULTI-DUTY

Interchangeable male, female and pipe points for centered and uncentered work. Nine sizes; Morse tapers 1 through 5, as well as straight.* Loads to 1500 lbs. at 100 RPM.

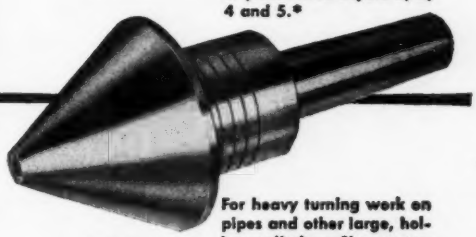
HEAVY DUTY

For your BIG jobs! For close tolerance turning on work up to 22,000 lbs. at 50 RPM. Eccentricity of less than .0002". Morse tapers 4, 5, 6 and 7.*



UNIVERSAL

Accurate to plus or minus .0001". Unusually high load capacity up to 5200 lbs. at 50 RPM means better work on a wider range of jobs. Morse tapers 2, 3, 4 and 5.*



NEW PIPE POINT LIVE CENTER

For heavy turning work on pipes and other large, hollow cylinders. Sizes range from 3" diam. to 7½" diam. Load capacities up to 22,000 lbs. Morse tapers 3, 4, 5, 6 and 7.*

Custom-Engineered Performance in Standard Models!

When you standardize on IDEAL Live Centers, *you get custom performance in standard models.* With IDEAL Live Centers you can meet practically any live center need *right from distributor stocks* — without delay or "special" ordering or engineering. This simplifies stocking, reduces inventory investment!

The IDEAL Live Center Line includes four separate models, in a range of sizes and tapers, to cover all common live center applications. They have been proven in hundreds and hundreds of plants where they are first choice for quantity and quality output.

Your IDEAL Distributor maintains an ample stock of IDEAL Live Centers to give you the centers you need when you need them. If you have particular problems he will suggest the live center that will do *your* job best.

Whenever you need live centers — see your dependable IDEAL Distributor — *first.*

***IDEAL Live Centers are also available in Brown & Sharpe and Jarno tapers**

Sold Through Leading Distributors

The Complete Line of Live Centers
Get them from stock —
Get them from your IDEAL Distributor

IDEAL

IDEAL INDUSTRIES, Inc.
4151 Park Avenue, Sycamore, Illinois
In Canada: Irving Smith, Ltd., Montreal

IDEAL INDUSTRIES, Inc.
4151 Park Avenue, Sycamore, Illinois IDEAL
Please send free catalog data on IDEAL Live Centers.

Name_____

Company_____

Address_____

City_____ Zone_____ State_____

CIRCLE INFORM-A-GRAM KEY NO. 9

HARDINGE
ELMIRA, N.Y.

COLLETS - FEED FINGERS - PADS

For Your

Automatic Screw Machines — Turret Lathes —
Chucking Machines — Tool Room Lathes — Millers and Grinders

Write for Descriptive Literature and Prices

Stock Delivery from 12 Locations

New York, Hartford, Baltimore, Philadelphia, Elmira, Dayton, Minneapolis, Detroit, Chicago, St. Louis, Oakland, Los Angeles

For: Brown & Sharpe, Cleveland, Cone, Davenport, Greenlee, Acme Gridley, National Acme, New Britain, Warner & Swasey, Jones and Lamson, Gisholt, Bardons & Oliver, Foster, Morey, Simmons, Ames, Atlas, Cushman, Hendey, LeBlond, Pratt & Whitney, Monarch, Bridgeport, South Bend, Kearney & Trecker, Linley, Van Norman, and others.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

OFFICES IN PRINCIPAL CITIES. Export Office: 269 Lafayette St., New York 12, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 10

. . . IF IT'S A HIGH PRODUCTION PROBLEM . . .

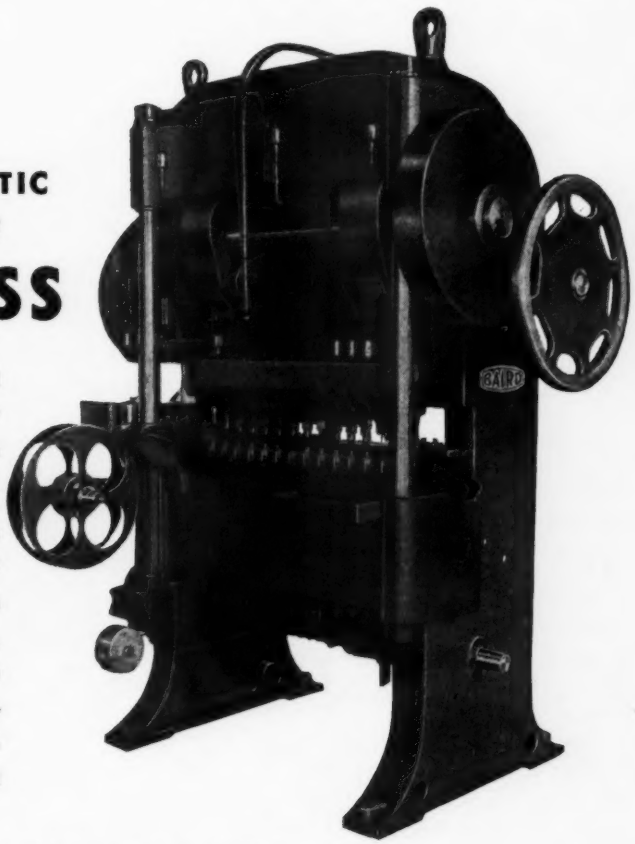
ASK BAIRD ABOUT IT

A COMPLETED PRODUCT AT EVERY TICK OF YOUR WATCH . . . OR *FASTER*

with the

BAIRD AUTOMATIC *MULTIPLE*

TRANSFER PRESS



Production of 3000 to 5000 accurately formed metal parts per hour is normal for this completely automatic Baird Transfer Press . . . even though 10 to 14 operations are included in a single cycle.

The machine shown is one of 12 standard sizes that have rated working pressures from 5 to 55 tons. Coiled stock from 2½" to 4" in width is automatically fed and blanks cut therefrom. Then, human-like fingers grip and transfer the blank to successive die stations for drawing, piercing, embossing, slitting, trimming, sizing, hexing, forming, etc. At each stroke of the machine, a finished piece is automatically ejected.

Tooling possibilities are practically limitless . . . with provision for stamping the widest variety of parts . . . for thousands of different uses. Here indeed is high production with lowest unit costs.

For a most favorable competitive position in today's markets, install a Baird Multiple Transfer Press. "Ask Baird about it." Write Dept. TP

THE BAIRD MACHINE COMPANY
STRATFORD CONNECTICUT

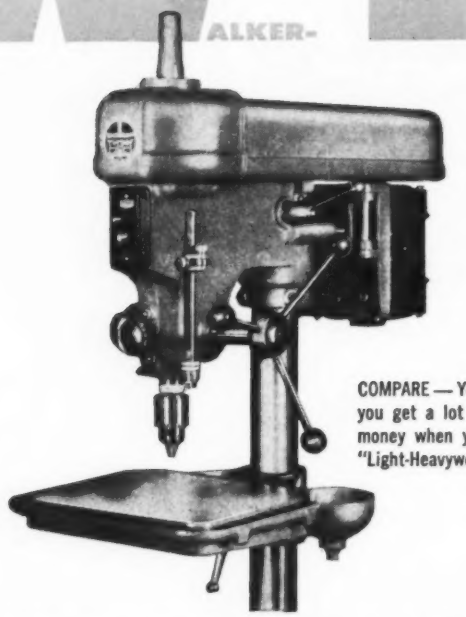
WHERE YOU WILL GET THE HELP OF SPECIALISTS ON THESE ESSENTIAL PRODUCTION PROBLEMS:

AUTOMATIC MACHINE TOOLS • AUTOMATIC WIRE & RIBBON METAL FORMING MACHINES • AUTOMATIC PRESSES • TUMBLING BARRELS

4BA55

CIRCLE INFORM-A-GRAM KEY NO. 11

W-T WALKER-TURNER



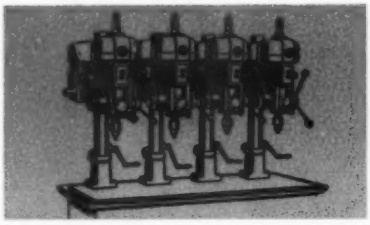
COMPARE — You'll see that you get a lot more for your money when you buy W-T "Light-Heavyweights"!

6″ Spindle travel means BIG MACHINE capacity in this 15″ Drill Press!

You don't have to go to a 20″ or larger drill press to get 6″ spindle travel. With this 15″ Walker-Turner, you can drill holes up to 6″ deep at one pass of the drill, in diameters from #60 to ½″.

This extra-capacity "LIGHT-HEAVYWEIGHT" is built to deliver fast, accurate production drilling in your plant, 24 hours a day, for a long span of years.

1300 Series — Walker-Turner "Light-Heavyweight" 15″ Drill Press — full 6″ spindle travel; six spline, full floating spindle; speeds from 480 to 5000 rpm, depending on motor and pulleys; Jacobs Chuck, or No. 1 Morse taper available. (15″



Walker-Turner "LIGHT-HEAVYWEIGHT" Drill Press with 4″ spindle travel — 1200 series — also available.)

Ask your Walker-Turner Distributor to *demonstrate* the big capacity of this 15″ W-T Drill Press. He's listed under "Tools" in your phone book's Yellow Pages. Or write for his name and full specifications on these machines.

DRILL PRESSES, HAND AND POWER FEED — AIR FEED DRILL PRESS ATTACHMENT
RADIAL DRILLS — WOOD AND METAL CUTTING BAND SAWS — TILTING ARBOR SAWS
RADIAL SAWS — JIG SAWS — CUT-OFF SAWS — LATHES — SPINDLE SHAPERS
JOINTERS — BELT AND DISC SURFACERS — FLEXIBLE SHAFT MACHINES

walker-turner

WALKER-TURNER
Division
Kearney And Trecker Corporation • Plainfield, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 12

Will You Be There?

Feb. 7, 8, 9. 11th Annual SPI Reinforced Plastics Division Conference. The Society of the Plastics Industry, Inc. Hotel Chalfonte-Haddon Hall. Atlantic City, N. J.

•

Feb. 16 & 17. Conference on "Materials Handling". Purdue University's Dept. of Industrial Engineering and Indianapolis Chapter of the American Materials Handling Society. Purdue Memorial Union Building, Purdue University, Lafayette, Indiana.

•

Feb. 27-29. American Management Association. Second annual electronics conference and exhibit. Hotel Commodore, New York.

•

Mar. 14-16. Spring Technical Meetings, Pressed Metal Institute. Carter Hotel, Cleveland, Ohio.

•

Mar. 19-21. Industrial Diamond Symposium. Armour Research Foundation of Illinois Institute of Technology and American Society of Tool Engineers. Illinois Tech Commons Building, Chicago.

•

Mar. 19-23. 24th Annual Convention, American Society of Tool Engineers, International Amphitheatre, Chicago, Ill.

•

Mar. 19-23. American Society of Tool Engineers Industrial Exposition, International Amphitheatre, Chicago, Ill.

•

Apr. 4-6. American Society of Lubrication Engineers. Annual Meeting and Exhibit. Hotel William Penn, Pittsburgh, Pa.

•

Apr. 10-12. Metal Powder Show. Hotel Cleveland, Cleveland, Ohio.

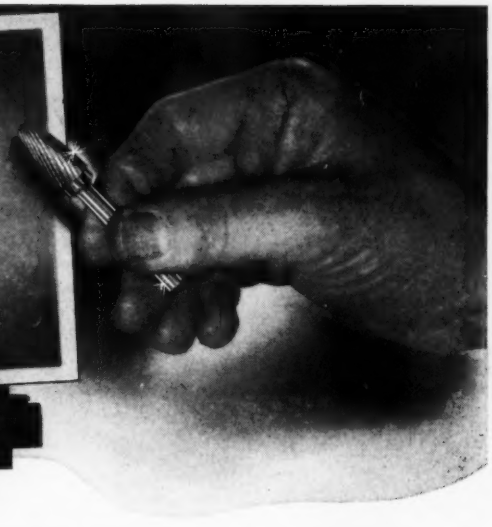
•

Apr. 16-18. Great Lakes District Meeting of American Institute of Electrical Engineers. Fort Wayne, Ind.

•

Apr. 18 and 19. Armour Research Foundation of Illinois Institute of Technology. First Annual National Industrial Research Conference. Hotel Sherman, Chicago.

LEADERS IN METALWORKING *depend on* LEADERS IN TOOLING



Quality, speed, precision . . . yes, and profits in metalworking usually depend on TOOLING! Engineering ingenuity based on experience together with quality control in uniformity of ATRAX tooling pays dividends in production . . . dividends in quality . . . dividends in profits.

Join the profit parade . . . follow the leaders!

Send for the 88 page catalog of ATRAX solid carbide tools TODAY!

THAT'S WHY METALWORKING LEADERS USE THIS

Atrax **CATALOG**

to specify these ATRAX SOLID TUNGSTEN CARBIDE TOOLS!

Atrax

Finish **FIRST** *with Carbide!*

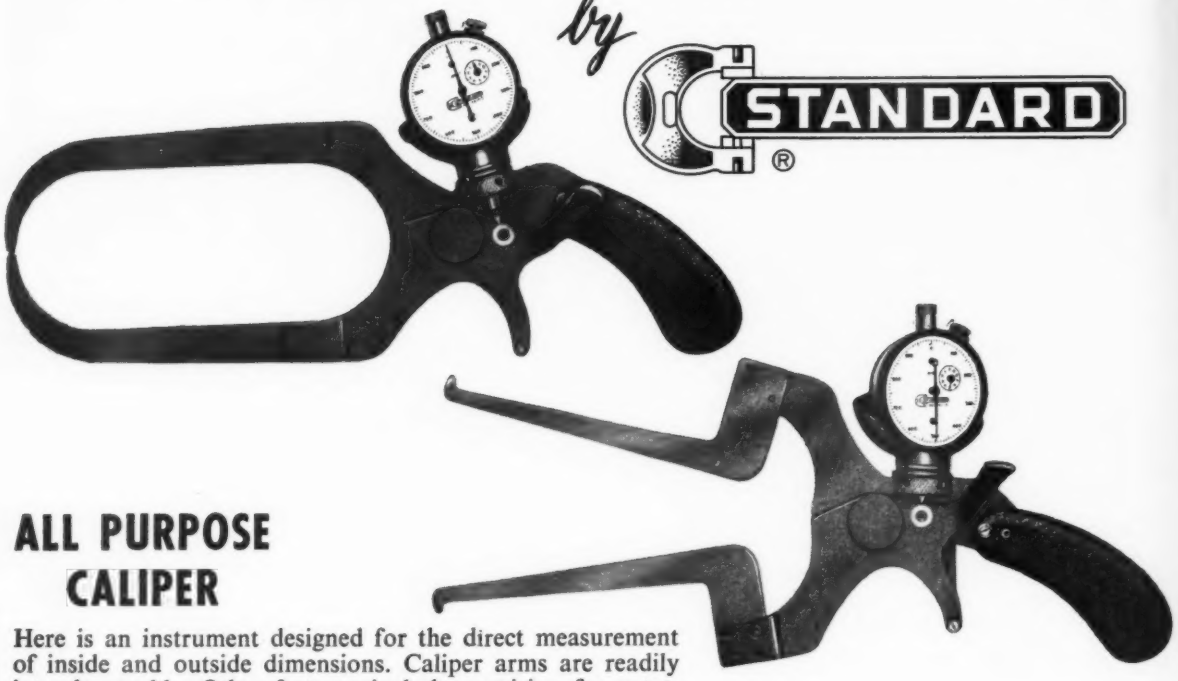
THE ATRAX COMPANY

Newington, Connecticut

CIRCLE INFORM-A-GRAM KEY NO. 13

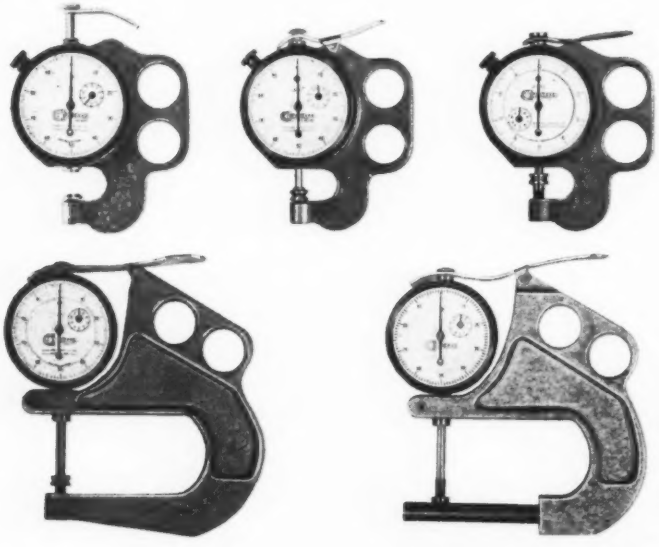
NEW CALIPER and THICKNESS GAGES

by STANDARD®



ALL PURPOSE CALIPER

Here is an instrument designed for the direct measurement of inside and outside dimensions. Caliper arms are readily interchangeable. Other features include provision for rotating the indicator and a two-position pistol grip. Indicator graduated to .010".



PORTABLE THICKNESS GAGES

Here is a series of convenient, easy-to-use gages designed to check the thickness of sheet metal, plastics, and even compressible materials such as leather. They are also useful for measuring diameters, lengths, and other dimensions of small parts. Deep-throated long range models are useful for clearing obstructions. Model shown at lower right is particularly well suited to measuring the wall thickness of tubing. Model shown at upper right is graduated to .0001"; other models graduated to .001".

FOR DETAILS WRITE TO

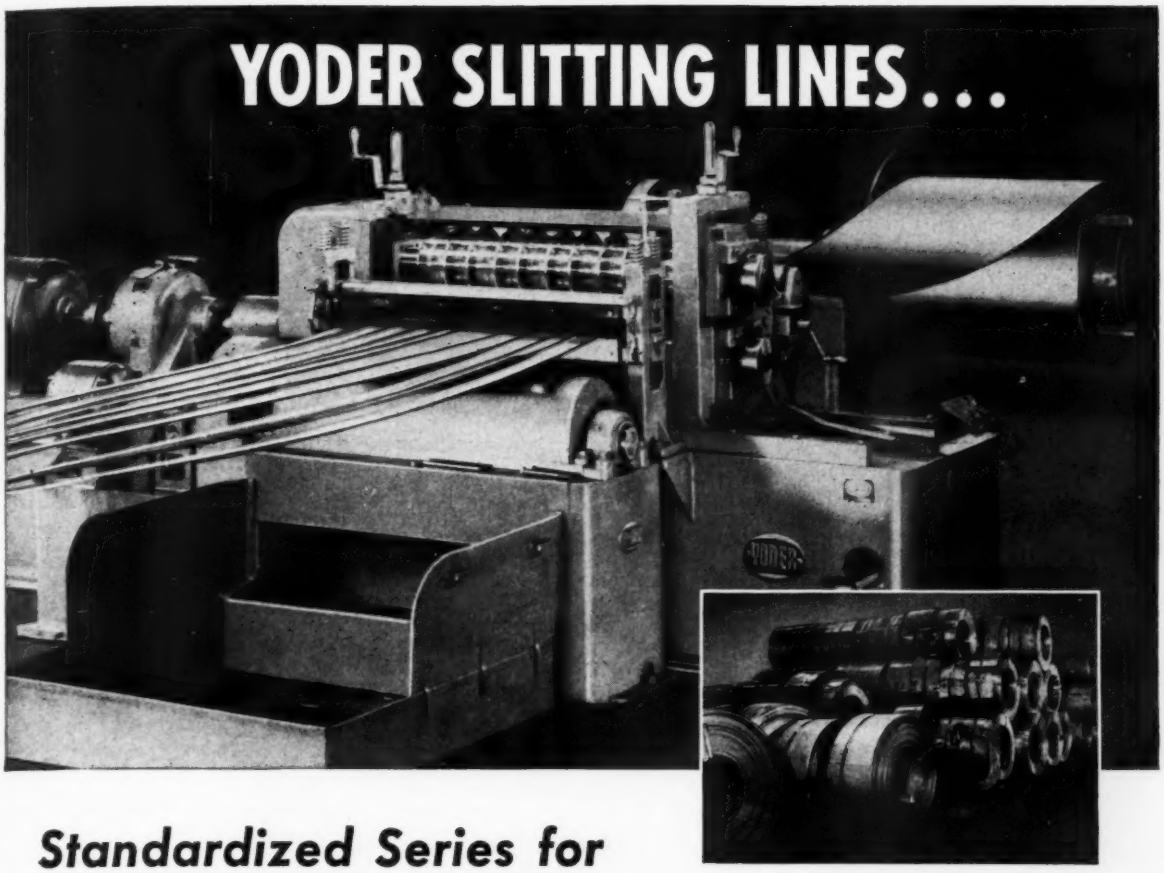
STANDARD GAGE COMPANY, INC.

76 PARKER AVENUE POUGHKEEPSIE, N.Y.

STANDARD® Gages

CIRCLE INFORM-A-GRAM KEY NO. 14

YODER SLITTING LINES...



Standardized Series for
LOW FIRST COST AND OPERATING COST!

A relatively small, low-cost Yoder slitting line offers attractive savings possibilities and high production in slitting small and medium coil sizes and strip gauges. Yoder has standardized a series of such machines, affording a rare combination of low cost and productive capacity amply sufficient for the needs of the great majority of sheet metal fabricators and custom slitting shops. Supplementing the standardized series are *special models for slitting big coils and heavy gauges at high speeds.*

For requirements as low as 100 tons per month, one of the standardized Yoder slitting lines will pay for itself in short order. The savings PER TON increase rapidly with decrease in coil size and width of strands to be slit.

Another important advantage gained by fabricators having their own slitter is the ability, from a relatively small stock of standard width coils, to meet expected and unexpected needs for slit strands in a few hours. This means easier production planning and greatly reduced strip inventories, in addition to lower prices and quicker deliveries of their strip purchases.

Yoder Slitter Book contains basic information on the economics and mechanics of slitter operation, with time and cost studies, production records and other valuable data. Send for it.

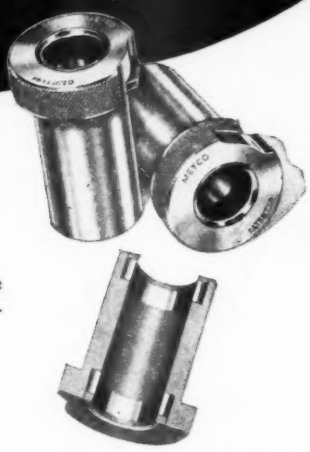
THE YODER COMPANY • 5501 Walworth Ave. • Cleveland 2, Ohio

ENGINEERING YODER MANUFACTURING

ROTARY SLITTING LINES
COLD ROLL FORMING MACHINES
ELECTRIC-WELD PIPE AND TUBE MILLS

CIRCLE INFORM-A-GRAM KEY NO. 15

DOUBLE BARRELLED SAVINGS with MEYCO carbide application "Know How"

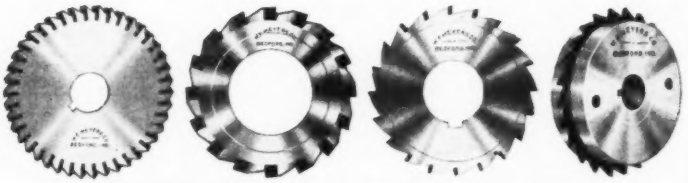


MEYCO
CARBIDE INSERTED DRILL JIG BUSHINGS

The most practical bushing ever made for high production and maximum accurate life, at lowest unit cost.

MEYCO
CUSTOM CARBIDE TOOLING

Precision made for more production per grind. Meyco production and engineering skill makes the difference. Made to your specifications—inquiries invited for prompt quotation.



MEYCO PRECISION CIRCULAR CUTTERS

For grooving, slitting, commutator undercutting and other operations to meet the requirements of your own individual applications: Solid carbide or carbide tipped.

SEND MORE INFORMATION ON

- ☐ Meyco Carbide Inserted Drill Jig Bushings
- ☐ Meyco Precision Circular Cutters
- ☐ Meyco Custom Carbide Tooling

NAME_____

COMPANY_____

ADDRESS_____

W. F. MEYERS CO., INC.
FAMOUS FOR PRECISION TOOLS SINCE 1888
BEDFORD, INDIANA

Our Engineering Department will gladly submit suggestions . . . we make your problem our problem.

CIRCLE INFORM-A-GRAM KEY NO. 16

Talking About Die Sets

WITH
PHIL MARSILIUS
Vice-President
The Producto Machine Co.

Proper Care of Die Sets—How can you be sure your die set will be as accurate the day you tool it as it was when the manufacturer assembled it? While he guarantees the set he has shipped to you, the manufacturer has no control over the treatment it receives after it leaves his plant.

Unusually rough treatment or exposure to moisture—which can occur in transit, on your receiving dock, in your stockroom or in your toolroom—can easily destroy the die set's accuracy. Though these occurrences are rare, you should protect yourself against them by a prescribed routine.

When a die set reaches your receiving dock, inspect it immediately. If rust or misalignment has occurred and is not detected until the set is ready to be tooled, you may have serious production delays.

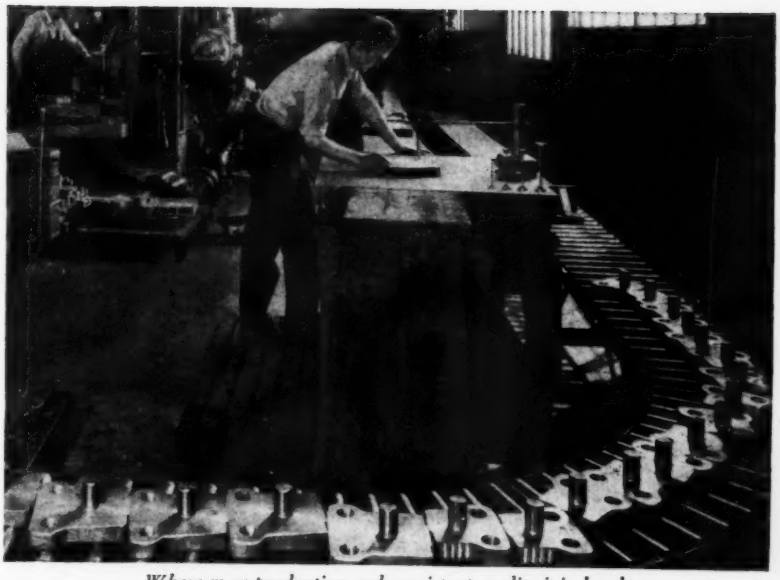
We recommend the following procedure: 1) Uncrate the die set; 2) Clean the set without disassembling; 3) Check it for parallelism; 4) Check it for free movement of punch holder; 5) Lubricate the pins and bushings; 6) Coat all critical surfaces with a light protective film of oil; 7) Store the set in a dry area on wooden blocks or pallets. You can then be sure that every die set is always ready for use.

If inspection shows something is wrong with the set, contact the manufacturer immediately for permission to return it for repair or have a replacement issued.

When production with the die has been completed, repetition of the above procedure will insure that the tooled die set will be ready for immediate use when needed again.

By these simple steps, you can preserve the degree of accuracy built into the die set.

Adv.



Where mass production and consistent quality join hands: one of Producto's die set inspection stations.

HOW PRODUCTO MAINTAINS CONSISTENT DIE SET ACCURACY FOR YOU

Though mass production of die sets makes possible larger stocks and faster delivery, it may also be the cause of sub-standard quality. *Only 100% inspection,* as practiced by Producto, can *consistently* maintain the accuracy of mass-produced parts.

At Producto, every die set component—die bed, punch holder, guide pin, bushing—is checked first at the point of manufacture, then at a secondary inspection station, and finally, at the assembly station. Not only are parts checked with highly-accurate surface plates and gages against precision standards, but also visually for flaws that might mar appearance.

Whether you specify two Producto die sets or two hundred, you can be sure they will be *consistently* accurate to the highest standards of the die set industry.

If you're looking for valuable ideas on die sets and their application, write for our free quarterly, *Die Set Digest.* And if you're looking for precision die sets fast, remember to call your nearest Producto branch.

THE PRODUCTO MACHINE COMPANY
970 Housatonic Avenue, Bridgeport 1, Connecticut
Telephone FOrest 7-8675

For prompt die set service, 'phone these PRODUCTO assembly warehouses:

Atlanta	CY 7667	Detroit	LI 6-7600	Philadelphia	MO 4-1010
Chicago	ES 8-3307	Kansas City	BA 9033	Rochester	GL 1810
Cleveland	SU 1-6158	Los Angeles	TR 9826	St. Louis	FR 1-3370
Dayton	MU 1651	New York	WO 4-7484	or check the Yellow Pages in	

any stamping center in the United States or Canada for distributors stocking PRODUCTO.

Produce More With

PRODUCTO

Precision Die Sets

CIRCLE INFORM-A-GRAM KEY NO. 17

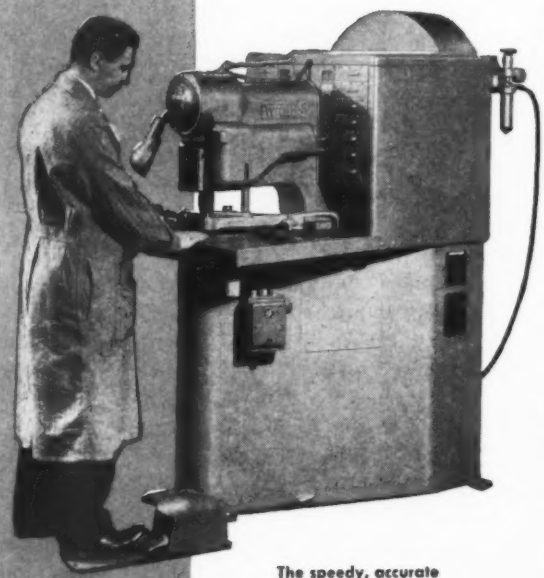
"My WALES FABRICATOR didn't cost me a DIME"

"I paid for it out of the PLUS-PROFITS from my first 3 jobs... the "WALES WAY"

"I'm on sub-contract production right now. Four month deal on each unit. Boy, oh boy . . . what this ten-ton WALES beauty has done for me. Yes sir . . . it's really paid for itself.

"One of my jobs has 126 holes of various sizes and four corner notches. Used to take me hours to set it up. Watch every ram stroke . . . double check every punch. My profit was skimmed to the bone.

"NOW, my total set-up time is never more than 29-1/2 minutes complete using the 'WALES WAY'. Sure, I'm making my profit and I'll soon need another WALES FABRICATOR".



The speedy, accurate Wales Fabricaror

Bill's experience is not unusual. With the WALES FABRICATOR you change punches and dies in less than 20 seconds. No templets needed. Work direct from blue prints. Handle small and large work with equal facility. 'Quick Change' holders up to 3-1/2" capacity. Completely automatic alignment.

Here is flexibility of production potential that brings additional contracts right to your door. The WALES FABRICATOR makes it possible.

Convenient Time Payments if you wish. 25% down and the balance over as long as five years if desirable. Thus the WALES FABRICATOR can readily PAY FOR ITSELF.

FREE ENGINEERING ANALYSIS

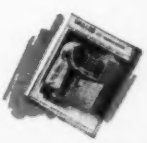
Our experienced Engineers will gladly analyze your shop problems. They'll give you exact answers as to time savings . . . dollar savings and methods to INCREASE YOUR PROFITS. Absolutely no obligation.

SEND FOR BULLETIN NO. 11A

Describes the WALES FABRICATOR, with pictures and examples of work. Time studies are added proving the exclusive features that make the WALES FABRICATOR such a profit making piece of equipment.

WALES MOBILE TRUCK UNITS

We'll be happy to carry the story of the "WALES-WAY" right to your shop with one of our Mobile Truck Units. Why not take advantage of this unique service and see for yourself what the WALES FABRICATOR can do on your production line.



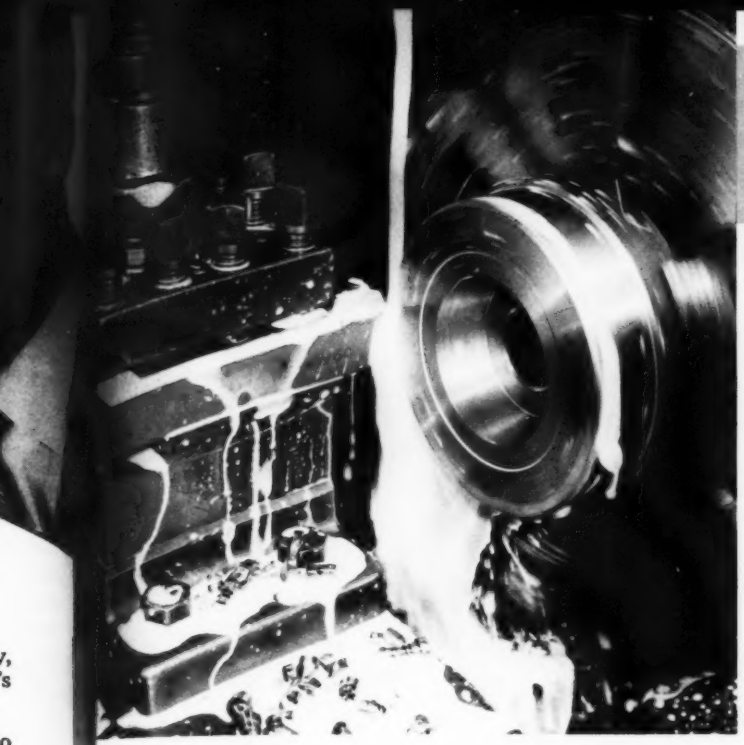
WALES Strippit CORPORATION

"...the Wales-Way is the PLUS-PROFIT way"

345 PAYNE AVE. — North Tonawanda, N.Y.

WALES-STRIPPIT OF CANADA LTD. HAMILTON, ONT.

carbide NEWS



With volume way up WESSON cuts prices up to 42%

Big Swing to "No Grind" Inserts Cuts Holder Prices

So big has been the demand for Wesson Multicut no grind carbide insert holders that price cuts up to 42% have been made possible without sacrificing a single one of the premium features that has made these holders the recognized quality leaders in the field. The cuts average 32 per cent with reductions on individual holders ranging from 23.8 to 42 per cent. Of interest is that the cuts come at a time when almost all items made of steel are going up in price.

Industry's overwhelming acceptance of these premium-feature holders has enabled Wesson to adopt large volume manufacturing methods with resulting major savings. "By passing on these manufacturing savings to our customers, we expect a still further expansion in applications," says W. B. Duncan, Wesson's board chairman.

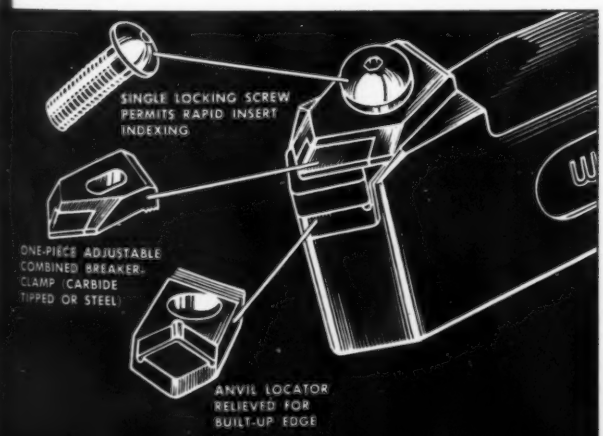
Six different basic styles of holders are standard in the Multicut no grind series with a total of 39 sizes available. These holders which allow quick indexing of the insert to present a new, sharp cutting edge and thus do away entirely with tool grinding are already being used on thousands of turning operations including internal boring and chamfering, straight and vertical turning, internal and parallel facing, etc.

All Premium Features Retained

Every feature which has made these Wesson tool holders the leaders in the no grind carbide insert field has been retained in making the price cuts. These include Wessons' exclusive one-piece clamp-breaker construction, adjustable chipbreakers and precision cast anvil-locators with relieved seats to clear built up edges when indexing. The single-screw lock for the chipbreaker allows indexing without dislodging the chipbreaker – particularly important feature when indexing holders used in upside down or similar positions. Clearance angles of holders are also larger than usual, permitting application on more types of jobs including internal operations.

The holders eliminate all tool re-grinding, reduce inventory of special holder parts, and greatly reduce down-

(continued on page 2)


SINGLE LOCKING SCREW PERMITS RAPID INSERT INDEXING
ONE-PIECE ADJUSTABLE COMBINED BREAKER-CLAMP (CARBIDE TIPPED OR STEEL)
ANVIL LOCATOR RELIEVED FOR BUILT-UP EDGE

Sketch of one of the Multicut holders for no grind inserts showing some of the premium features

Big Swing To "No Grind" Inserts

(continued from page 1)

time for tool changes. Setup time is also less.

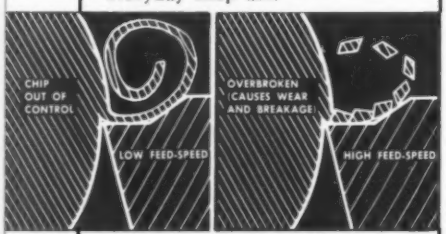
Complete details of the Multicut series for no grind inserts are contained in the reprint "New Trend in Carbide Tooling" and in illustrated bulletin No. 5510-M. Both are available from Wesson. The holders will be the "ASTE Blue Ribbon" feature in Wesson's Booth #450 at the Tool Show in Chicago, in March.

New Breaker Guide is Industry First

Industry's first comprehensive guide to mechanical chip-breakers for no grind inserts will be issued shortly by Wesson Company. The company's Research Division is now analyzing the results of a broad range of laboratory and practical shop tests.

"This new guide, we believe, will be highly useful to every size shop now doing or planning to do machining with 'throw-away' insert tooling," says W. B. Bader, research division head.

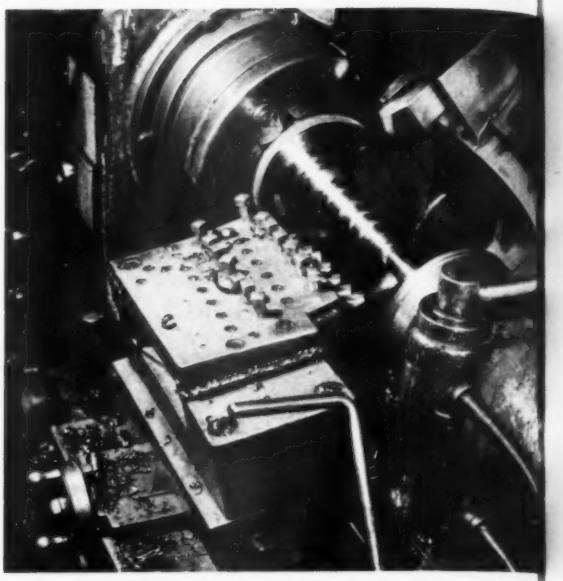
The new guide will reveal the ACTUAL effective range for specific chip breaker dimensions at various speeds and feeds. To obtain the basic data, tests have been conducted on all of the most commonly used steels. Test findings and recommendations are being illustrated and simplified for everyday shop use.



Wesson's new guide will tell how to avoid conditions like these with insert tools

Copies of the forthcoming guide may be reserved now by writing to Wesson Company, Dept. AD, 1220 Woodward Heights Boulevard, Detroit 20, Michigan. Ask for "New Chip Breaker Guide." Copies will be mailed immediately after printing to all advance requests.

Tool Costs Tumble from 9¢ to 2¢ per Piece With Wessonmetal "26"



Eight "26" brazed flat tools and one Multicut insert holder cut tool cost of rough turning and facing alloy steel stem gear

Significantly lower tool costs and a nearly doubled production rate were results of a switch to Wessonmetal "26" carbide in a large eastern gear manufacturing plant. The comparison was with several steel cutting types and grades previously used.

The operation consists of facing and rough turning 32 Rockwell C alloy steel stem gears on a 20-in. Fay automatic lathe. The multiple tool setup used eight Wesson brazed-type flat tools tipped with grade "26" and one Multicut holder.

Formerly, the job was done at 525 rpm and 270 sfpm but it was found possible to boost this to 580 rpm and 305 sfpm with Wessonmetal "26" while getting far better tool life. Depth of cut now averages 3/16-in. As a result, one-fourth of the machining time has been chopped off (now 1½ minutes). This, plus the lower down time for tool change with longer tool life has nearly doubled hourly production (from 30 pieces per hour to 50).

Savings with Wessonmetal "26" came from 4 sources: (1) The larger number of grinds possible (9 to 10 vs. 4) due to reduction in edge wear and breakage, (2) more than doubling the pieces per grind, (3) fewer tool changes required, and (4) higher output per hour.

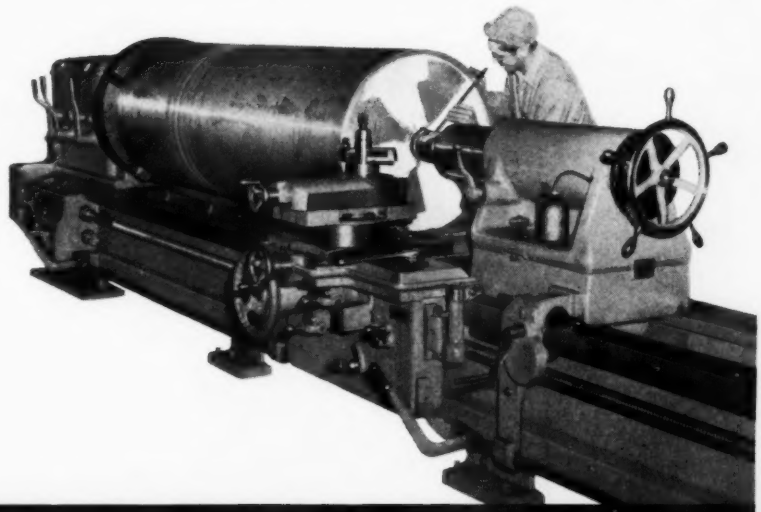
Pieces per grind with Wessonmetal "26" ranged from 125 to 175. This compares with 60 to 70 per grind with other carbides. However, grade 26 tools only showed a normal .014 wear after 175 pieces as against far greater stock removal per grind previously. Total pieces per tool ranged up to 1400 for Wessonmetal "26" as against an average of 280 formerly.

Nebel LATHES CINCINNATI

Nebel lathes are available in engine, removable block gap and extension bed gap models, 16″ to 50″ swing sizes. Write for descriptive literature.

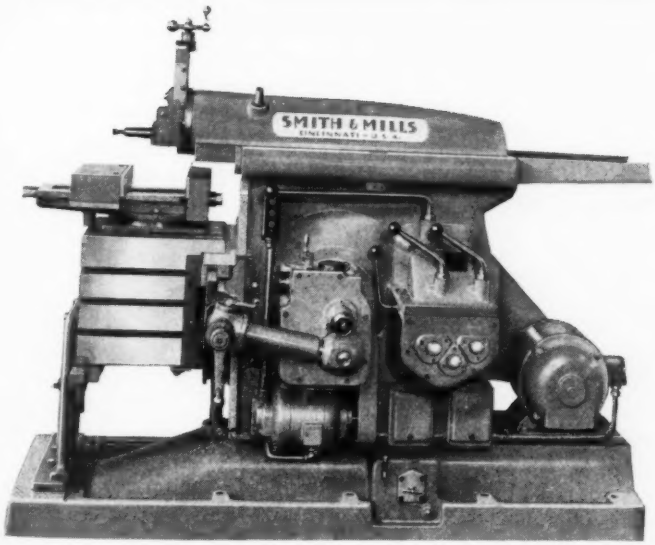
King-size turning

—like this huge Lukens steel mill roll—call for the power, speed and accuracy of Nebel heavy duty engine lathes. This 36″ Nebel 'F' series lathe has the stamina to support such enormous loads, and the power to turn them quickly and accurately day after day.



NEBEL MACHINE TOOL CORP., CINCINNATI 25, OHIO

SMITH & MILLS SHAPER DIVISION • NEBEL LATHE DIVISION



Smith & Mills Shapers now available in Heavy Duty Models in 16″, 20″, 25″, 28″, 32″ and 36″ strokes, and Standard Duty Models in 20″ and 24″ strokes.

Perfect for production

or tool room work. That's what our customers tell us about these fine Smith & Mills Shapers. *Check* Smith & Mills for speed, cutting power, versatility and precision performance—and you'll *buy* Smith & Mills—famous for high quality shapers since 1888. Write or wire for prices, deliveries, repair parts or field service.

Smith AND Mills SHAPERS CINCINNATI

CIRCLE INFORM-A-GRAM KEY NO. 21

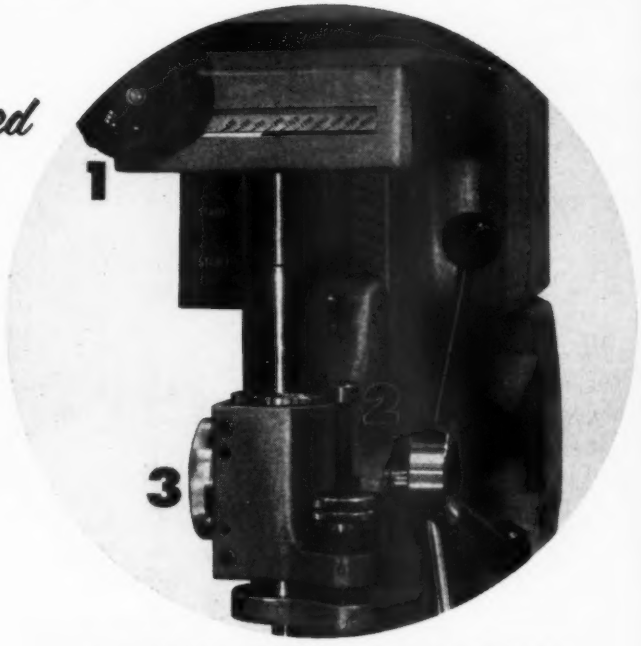
EDLUND Sensitive Drilling Machine

MODEL 1F

Infinitely Variable Speed

10,000 R.P.M.

Model 1F—2 Spindle Pedestal Type



1 INFINITELY VARIABLE SPEED CONTROL
Simply turn knob for *any* speed within range of the machine. Swift, powerful, and positive action.

2 MICROMETER GRADUATED DEPTH GAUGE
Permits accurate pre-set depth control for all precision production drilling. Clearly graduated to .001".

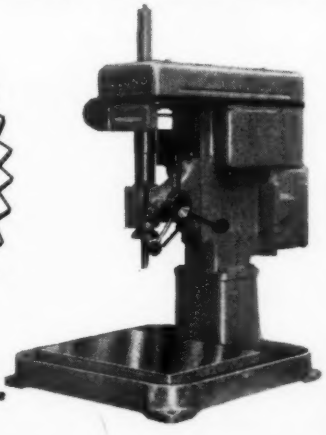
3 ADJUSTABLE SPINDLE TENSION CONTROL
Compensates for different drilling conditions. Three handle feed lever reduces worker fatigue.

The Ideal Drilling Machine for High Speed Sensitive Drilling of Small Parts, Light Assemblies, and Instrumentation.

SPECIFICATIONS

Overhang	7"
Capacity (Cast Iron)	⅜"
#1 Morse Taper or Jacobs Chuck	0-⅜"
Speed Range — Optional	
625 to 5000 RPM	
1250 to 10000 RPM	
Spindles — 1 to 6	
Pedestal and Bench Types	

America's Most Popular Drilling Machine



Model 1F—1 Spindle Bench Type

Send for Free Illustrated Bulletin #160

EDLUND
MACHINERY COMPANY Cortland, New York
Division Precision Castings Co., Inc., Subsidiary Harrisburg Steel Corporation

EDLUND REPRESENTATIVES IN MAJOR CITIES

CIRCLE INFORM-A-GRAM KEY NO. 22

MICROMETER THIMBLE is graduated to .0001" and provides dimensions between 1" steps on measuring bar. Measuring bar can be adjusted to enable the user to take readings up or down relative to a center line or other reference line on the work.

accurate to .00005" throughout the 18" range

That's right! Just 10 seconds to set this NEW 18" PLA-CHEK GAGE . . . and you are ready to start your inspections. In hundreds of installations on innumerable jobs PLA-CHEK GAGES are daily proving their time-saving and money-saving advantages. Extremely easy to operate—no auxiliary gage blocks are necessary—this PLA-CHEK 18" model guarantees accuracy to fifty millionths through its entire range. The measuring bar is made of deep-frozen, strain-free alloy steel. Because it is of one-piece construction the steps cannot change or separate with age. Since it is not necessary to touch the measuring bar, body heat does not affect it. Return the coupon or write TODAY for literature and complete details.

Cadillac PLA-CHEK GAGES are available in a complete range of sizes: 6", 12", 18", 24", 36", and 48" models. Precision-made risers, increasing the range of each model, are also available.

Cadillac
GAGE COMPANY
P. O. BOX 3806 • DETROIT 5, MICHIGAN

CADILLAC GAGE COMPANY
P. O. BOX 3806, DETROIT 5, MICHIGAN
Without obligation please rush complete information on the Cadillac PLA-CHEK Gage line to:

Name_____

Company_____

Address_____

City_____ Zone____ State_____

CIRCLE INFORM-A-GRAM KEY NO. 23

modern MACHINES demand

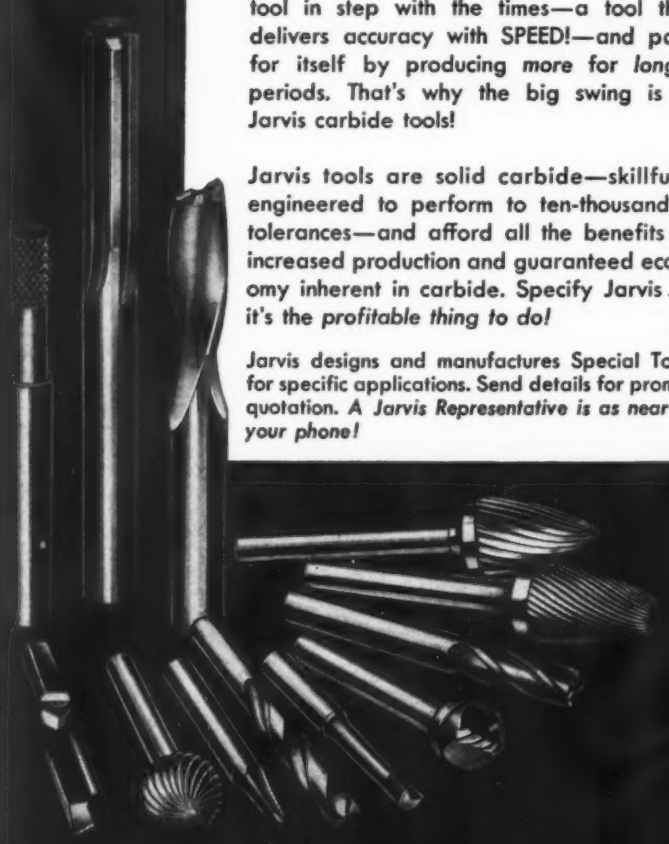
MODERN solid carbide TOOLING!

Jarvis SOLID CARBIDE GIVES MAXIMUM EFFICIENCY AND ECONOMY!

Forward-thinking management demands a tool in step with the times—a tool that delivers accuracy with SPEED!—and pays for itself by producing *more* for *longer* periods. That's why the big swing is to Jarvis carbide tools!

Jarvis tools are solid carbide—skillfully engineered to perform to ten-thousandths tolerances—and afford all the benefits of increased production and guaranteed economy inherent in carbide. Specify Jarvis... it's the *profitable thing to do!*

Jarvis designs and manufactures Special Tools for specific applications. Send details for prompt quotation. *A Jarvis Representative is as near as your phone!*



Send today for catalog describing hundreds of Jarvis production-increasing tools.

Jarvis CORPORATION

POWER TOOLS FOR INDUSTRY

MIDDLETOWN, CONNECTICUT

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Talk of the Month

★ ★ ★ ★ ★ ★ ★ ★

Atoms Cutting Across the Business World

by Charles Robbins

ATOMIC INDUSTRIAL FORUM, INC.

New York, N. Y.

Adapted from a talk delivered before the recent Conference for Management, held in conjunction with the World Nuclear Congress and International Atomic Exposition, in Cleveland, Ohio.

ANY DISCUSSION of "The Place of the Atom in Your Business" should be preceded with a brief review of the place of energy in everybody's business, with perhaps particular emphasis on its place here in the United States. This is because "everybody's business" is in fact the market, and the discussions here today are looking to the market for atomic energy.

Today the businessman looks at energy and recognizes its importance, and relates it to himself and his business. I suppose one reason for this is that there has been talk that some day, in the not too distant future, we will begin to run low on our conventional forms of energy. One might have gotten pretty pessimistic about the prospects of a continuing rising industrial production in this country and throughout the world until atomic energy appeared on the horizon.

Energy occupies a larger role in our thinking today because we realize — and the businessman is increasingly aware of this — that our living standard is simply an expression of energy applied to matter. It is the sun's energy which causes the seed to sprout and grow, and it is energy from fossil fuels which harvests and mills and transports and prepares the grain for the table. Or it is energy from fossil fuels which digs and transports the ore and takes it on through myriad operations and to the point of its use by the ultimate buyer.

It has been only in the past century that man has utilized more of the sun's energy than was readily apparent and easily accessible. It was only about 100 years ago that

. . . *Continued on page 34*

CIRCLE INFORM-A-GRAM KEY NO. 24

"our twin-head AXELSON doubles production of a job we handle with kid gloves"

Mr. S. J. Williams operates S. J. Williams, Inc. in Schiller Park, Illinois.

"When we get a real ticklish job, we handle it with care. These precision radar equipment housings, for example. We built special cabinets to stack them separately while they're in process.

"The Axelson makes it possible to produce two housings in the same setup, because with our Axelsons we can use two identical milling heads on the same machine. No problem of holding tolerance even at the exceptionally high speeds we use. Surface finish is excellent. Spindles can be adjusted in exact relationship to each other. For duplicate milling, you can't find a better setup.

"I know there are all kinds of fine milling machines on the market and all kinds of prices too. But our Axelsons do the job for us. That's why we have two of them."

One of two 10 RH Axelson Milling Machines at S. J. Williams, Inc. Each machine has twin All-Angle milling heads.

Write for free catalogs on Axelson Milling Machines.

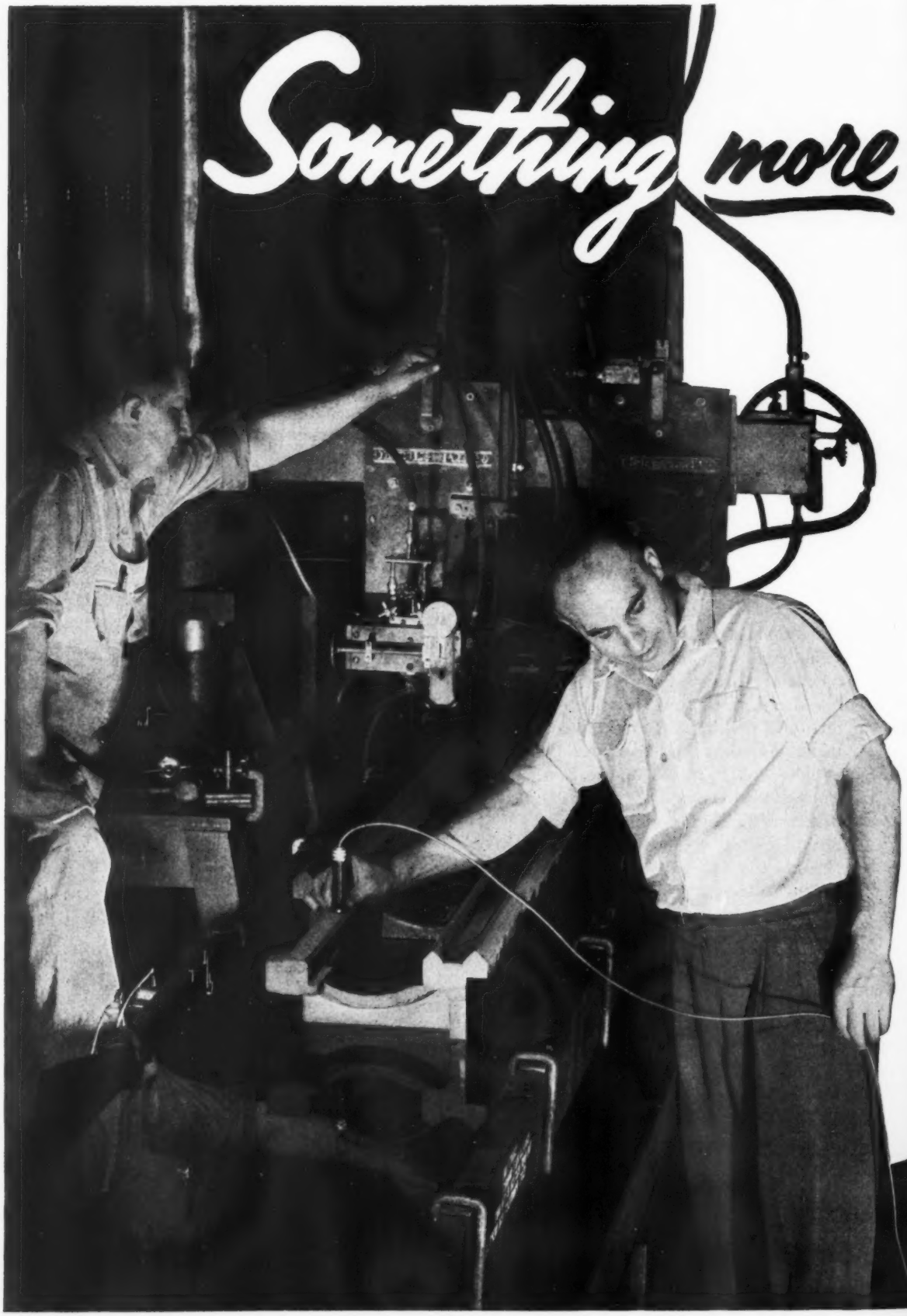
AXELSON
MILLING MACHINES
make man hours mean more

Producers of the World famous Axelson Lathe

AXELSON

AXELSON MANUFACTURING COMPANY
DIVISION OF U. S. INDUSTRIES, INC.
6160 S. BOYLE AVENUE, LOS ANGELES 58, CALIFORNIA • Dealers in Principal Tool Centers of the U. S.

CIRCLE INFORM-A-GRAM KEY NO. 25


Something more

than quality control...

makes Hendey lathes life-long money-makers in your toolroom or shop!

"We cannot produce a bad motor car. The guards would not permit it to leave the factory!" This statement was made by the executive head of Rolls-Royce, Ltd. Here at Barber-Colman Company, we sense the same devotion to perfection that marks the craftsmen who produce these fine automobiles.

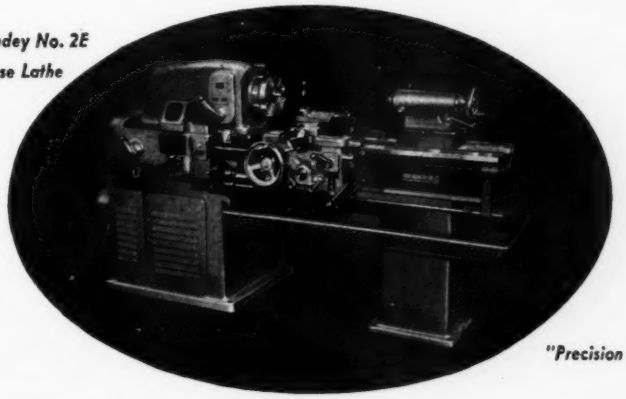
At the left you see the exclusive induction hardening machine which is used to harden all Hendey bed ways. The inspector is checking the hardness of the ways with the most modern electronic comparator. The ways for both the carriage and tailstock are integral with the bed and are precision ground after hardening. Greatest possible accuracy and maximum wear resistance are qualities of the finished ways.

We are proud of the quality we build into our machines — proud of the exclusive features that have been designed into them.

For example, our No. 2E 14 in. General Purpose Lathe is equipped with an *electronically controlled* drive that provides infinitely variable spindle speeds between 15 and 1500 rpm. This feature increases operator efficiency, produces higher torque at low speeds, and permits changing speeds smoothly while the machine is under load.

These and other Hendey features mean profitable operation on toolroom or production turning jobs. Your Hendey dealer will be glad to discuss your machining problem with you. Call or write him today!

Hendey No. 2E
14 in. General Purpose Lathe



"Precision with Production"

Hendey machine division
BARBER-COLMAN COMPANY
27 LOOMIS ST., ROCKFORD, ILLINOIS

BARBER COLMAN

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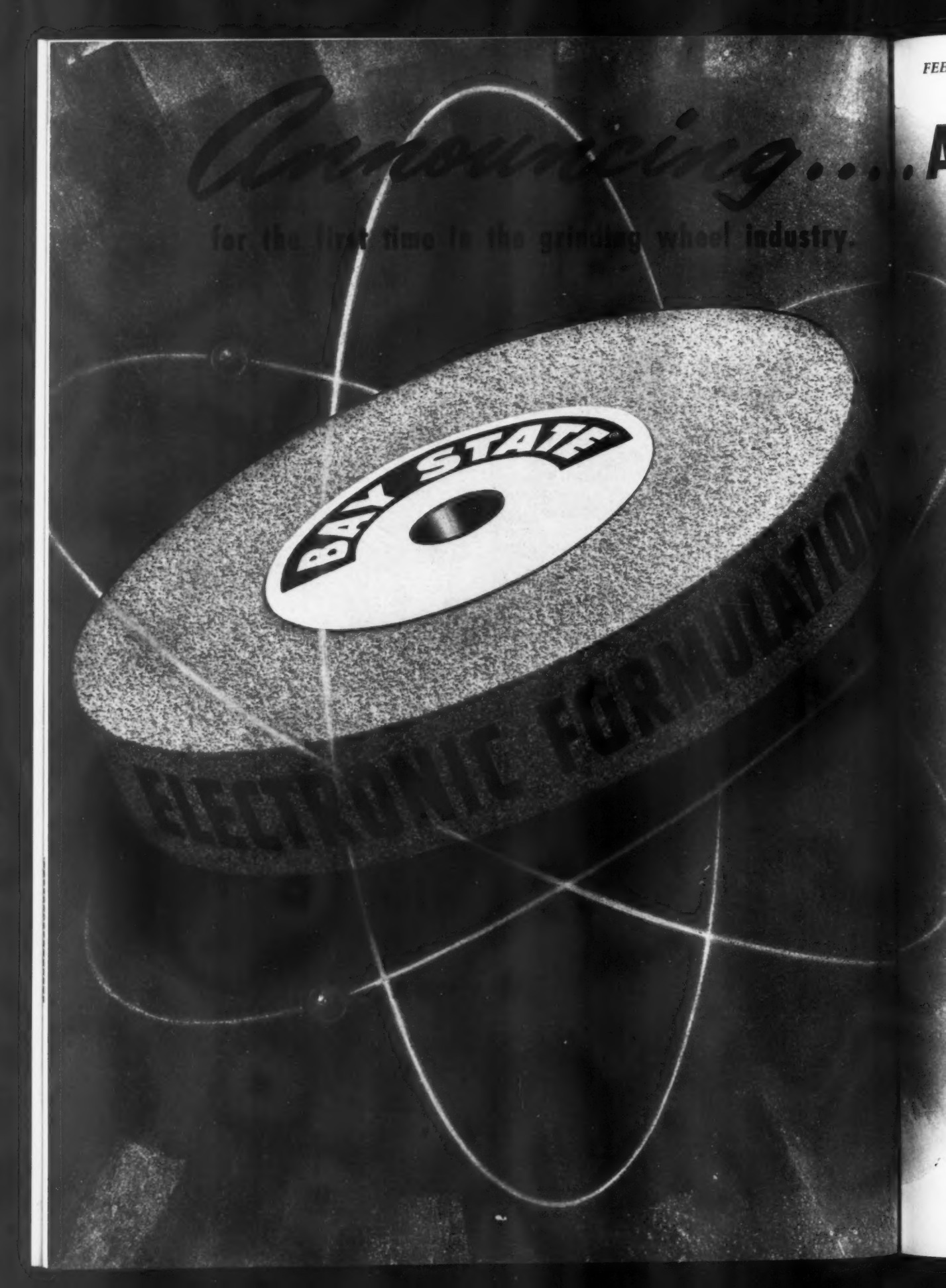
Announcing....
for the first time in the grinding wheel industry.
BAY STATE
ELECTRONIC FORMULATION

..A NEW ELECTRONIC PROCESS

Bay State Grinding Wheel Formulas are now computed AUTOMATICALLY!

ELECTRONIC FORMULATION means this for you:

★ **GREATER ACCURACY IN ENGINEERING.**

The ELECTRONIC FORMULATION system precisely spaces every interval between grade and structure changes equally along a perfect progression. This gives the Bay State abrasive engineer the industry's most accurate measuring device for recommending wheel specifications that will fit your job best.

★ **GREATER ACCURACY IN MANUFACTURING**

Electronic precision replaces the possibilities of human error in figuring formulas which control the manufacture of every Bay State wheel. This precision makes sure you get the special grinding qualities determined best for your job.

★ **GREATER ACCURACY IN DUPLICATION.**

Formulas for every Bay State grinding wheel are preserved on punched cards for electronic computers. This insures absolute accuracy in duplicating wheel formulation, with FASTER ORDER PROCESSING.

★ ★ ★

Truly "Wheels of Progress" in action, the ELECTRONIC FORMULATION *system is an exclusive* BAY STATE *development. Its many advantages are yours when you call your* BAY STATE DISTRIBUTOR, *or factory representative, for complete "on-the-job" engineering service.*

BAY STATE ®
WHEELS of PROGRESS

BAY STATE ABRASIVE PRODUCTS CO., Westboro, Mass., U.S.A.

Branch Offices and Warehouses —
Bristol, Conn.; Chicago, Ill.;
Cleveland, Ohio; Detroit, Mich.; Pittsburgh, Pa.
Distributors — All principal cities
In Canada:
Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ont.

Manufacturers of all types of Quality Abrasive Products

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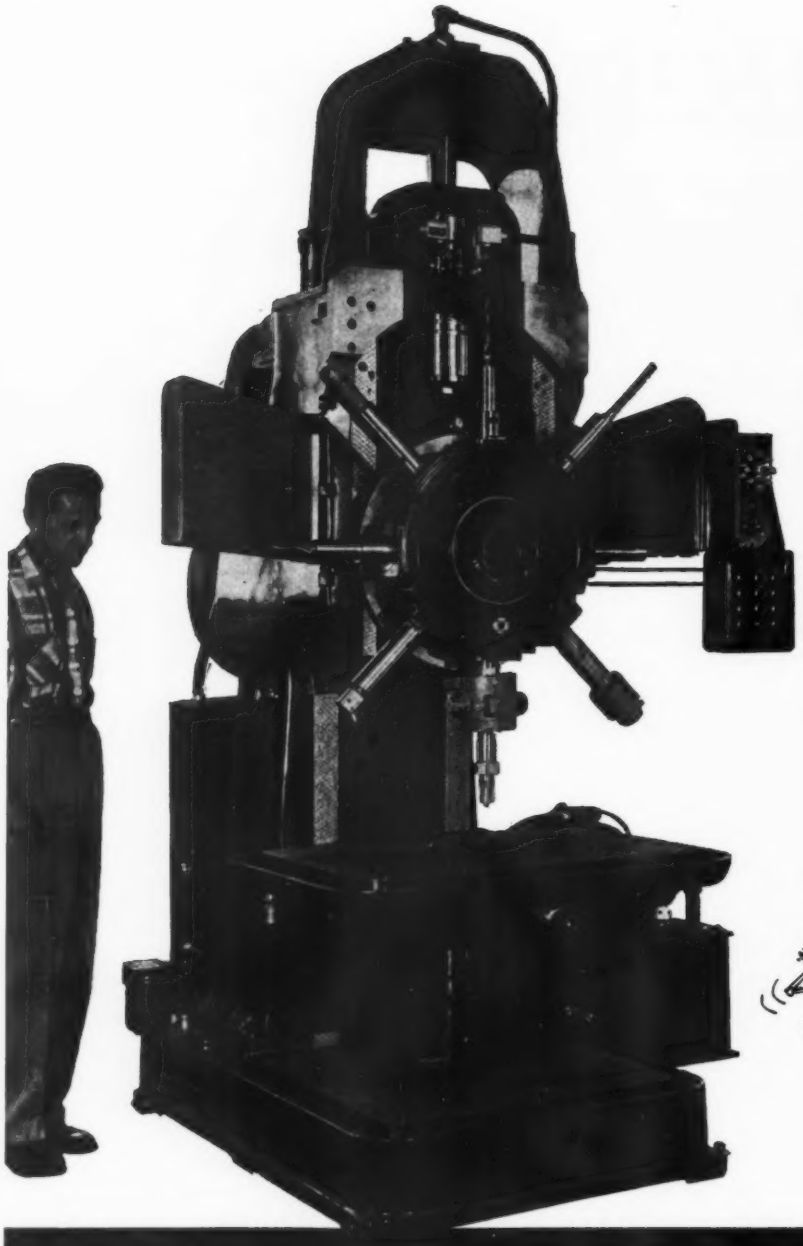
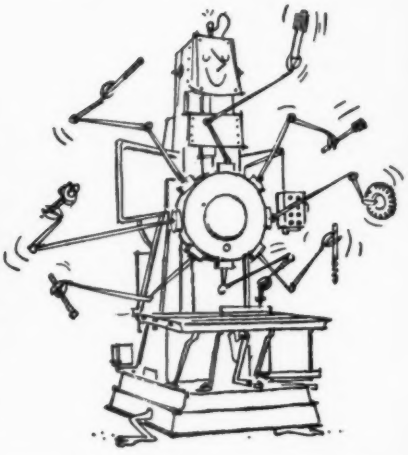


The highly versatile

3BH BURGMASTER® Automatic Hydraulic TURRET DRILL

does any combination of 8 operations in one set-up



...drilling, reaming, counterboring, countersinking, spot facing, tapping, O. D. threading and numerous other second operations can be accomplished—with one operator—quickly and simply. Metal working plants throughout the country are finding that quality and accuracy of work are greatly improved, while costs drop. The reason is basic. Each tool change is brought to the work. The need to carry or shove, then realign the work manually with resultant time loss, accuracy loss and increased fixture cost, is eliminated. It will pay you to investigate this rugged, precision-built universal machine.

For complete information, write Dept. TP-2

BURG TOOL MANUFACTURING CO., INC.
15001 S. Figueroa St., Gardena, California
NEW YORK • CHICAGO • SAN FRANCISCO

Check these features:

Automatic hydraulic • 8 spindle • 1½" drill capacity in mild steel • 12" stroke • 20" throat depth • 10HP motor • infinitely variable pre-selective feeds • automatic cycling (easily ties in with auto index tables, positioning tables and index fixtures) • pre-selective spindle speeds • pre-selective, extremely accurate depth control • pre-selective length of rapid approach.

Other models include:

hand operated, 6 spindle; ram type radial, 6 spindle; automatic hydraulic, 6 spindle.

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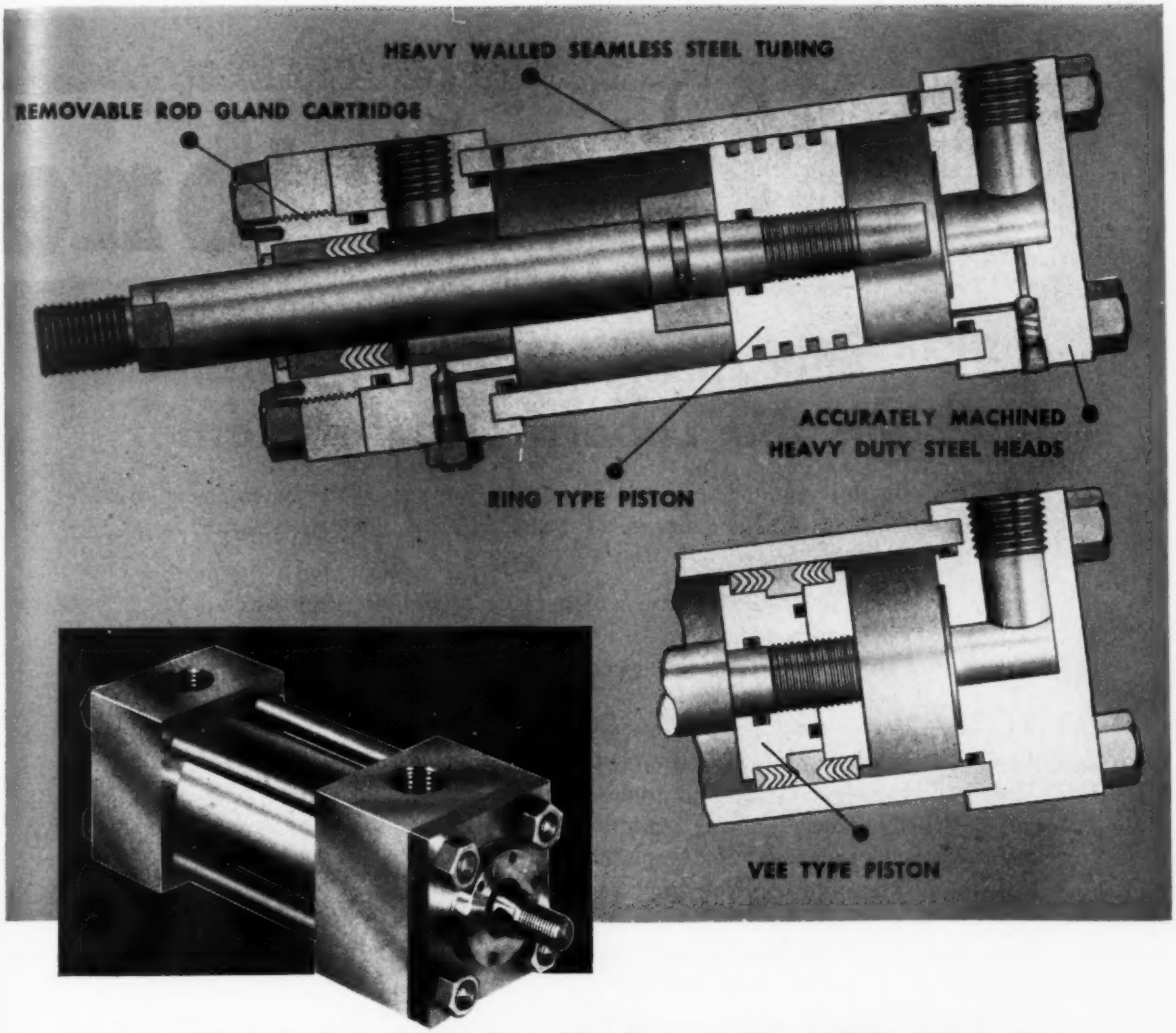
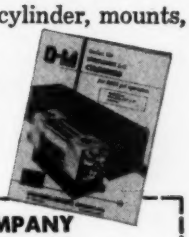


New Hydraulic Cylinder Designed for High Pressure Heavy Load Applications

A new hydraulic cylinder conservatively rated at 2000 PSI has been developed by the Ortman-Miller Machine Company. This cylinder meets JIC standards and is designed to provide maximum performance with minimum maintenance to meet the demands of modern industry.

To insure a combination of performance and dependability Ortman-Miller specifications include: heavy walled seamless steel tubing micro-honed for minimum friction; rolled steel heads recessed to confine the tube, prevent breathing and provide additional protection against leakage under the most severe usage; piston rods hard chrome plated, turned ground and polished from stress relieved high tensile steel; multiple lip self-compensating rod gland packing providing excellent pressure sensitivity with long life. This packing is contained in a removable cartridge which facilitates replacement without disassembling the cylinder.

Available in bore sizes from 1½ to 8-inch inclusive. Complete engineering drawing of cylinder, mounts, mounting brackets and a capacity chart are included in the new O-M Bulletin 105. This is free on request. Write for your copy today.



ORTMAN-MILLER MACHINE COMPANY
19 143rd Street, Hammond, Indiana
Please send FREE bulletin 105
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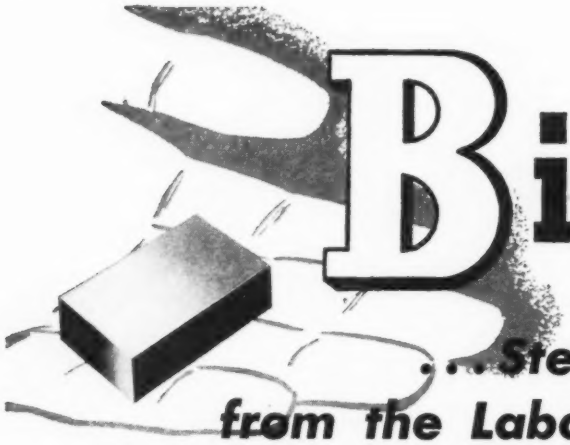


Birthstone ...

...Steel Cutting Carbide from the Laboratories of Ramet

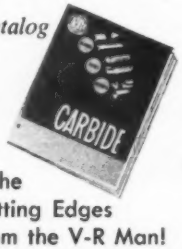
1930 — In this year the stage for automation was set by the development of tantalum-carbide in the laboratories of Ramet Corporation of America, now Vascoloy-Ramet Corporation.

Here was the first successful steel-cutting grade of carbide. Here was a cutting edge for which machine tools were yet to be developed. Here was the birthstone for today's mass production, for cutting speeds and tool life previously impossible.

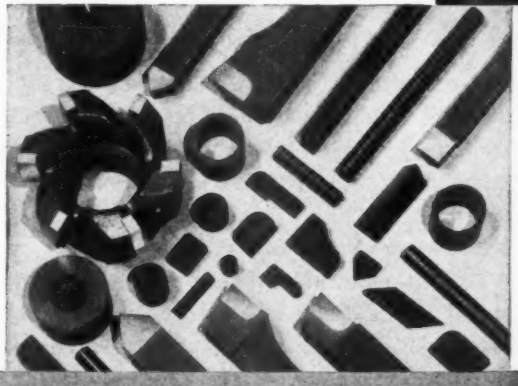
TODAY — Vascoloy-Ramet research and development has speeded the progress of cemented carbide tools. Improved manufacturing, design, application and quality control plus new carbide grades, new tools and new toolholders offer the carbide user constantly growing opportunity for speeding production and lowering costs. Applications not feasible yesterday are in successful, profitable use today Ask your V-R man to help you apply carbides more fully.

TOMORROW — The carbide frontiers of today are being crossed one by one through continuous development and application engineering. The carbide industry has learned never to say "it can't be done". Your V-R man can help you develop carbide applications to reduce costs on jobs now being done with less efficient tooling. Talk it over with him.

Write for V-R Carbide Catalog for complete information on V-R carbide products.



VISIT V-R in Booth 1137 at the 1956 ASTE Industrial Exposition, International Amphitheater, Chicago, March 19-23



Get the Cost-Cutting Edges from the V-R Man! *Call your local V-R distributor or representative.*

Pioneers in Cemented Carbides • Tools Blanks • Toolholders • Inserts • Dies

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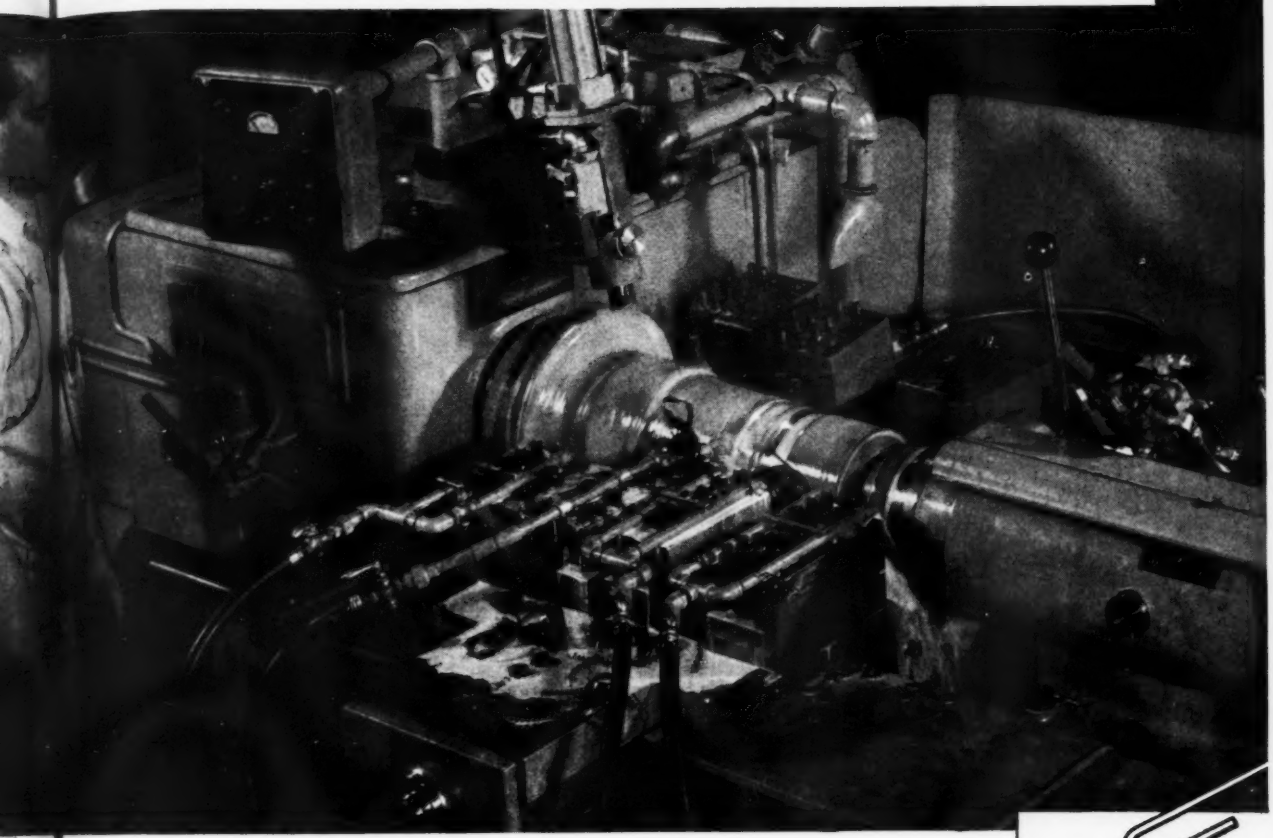
# of Automation



How V-R Cutting Edges Can Cut Your Costs

$800 Yearly Saving on One Machine . . .

A major electrical equipment manufacturer reports this impressive saving on turning steel shafts for electric motors since replacing previous carbide tools with V-R Carbide.

75% More Output Per Grind . . .

In boring the I.D on a cast steel transmission housing, a leading automobile manufacturer reports 700 pieces per grind with V-R Carbide compared to 400 pieces with previous carbide.

Output Increased Six Times . . .

Rough turning, semi-finishing and cutting off to length of Inconel X bolts was increased from 5 pieces per day to 30 at a well known aircraft plant when V-R Carbides replaced another type.

. . . and, **TANTUNG TOOLS,** made of V-R's *exclusive* cast alloy with high red-hardness, low friction coefficient and extra high strength. Get the facts about these tools that bridge the gap between high speed steel and cemented carbides. Ask for CATALOG.

MANUFACTURERS OF—CARBIDES . . . TANTUNG . . . INVESTMENT CASTINGS . . . MINING TOOLS

Vascoloy-Ramet Corporation

SUBSIDIARY OF FANSTEEL METALLURGICAL CORPORATION

888 S. Market St., Waukegan, Illinois

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for { —greater confidence in gaging results
—continuous uniformity of production
—lower gage costs per piece inspected

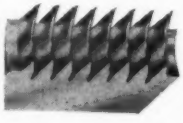
get BESLY METRO GAGES

Quality-Built to

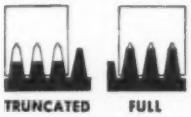
STAY ACCURATE LONGER

Micro-Lapped Finish
keeps gages accurate longer by reducing wear. No sharp "hills" and "valleys" to wear quickly and reduce gage accuracy.

Extra Clearance
at root of ring gages permits wear correction.



Truncated Thread Form



of thread plug at no extra cost. Enables accurate setting and permits easy check for gage wear.

Convolution of First Full Thread
on thread plug and ring gages removes sharp scoring edges and prevents chipping. Also makes Besly-Metro Gages easier to use.

Stress-Relieved
during manufacture by "deep-freezing" to normalize and relieve stresses and strains.

Lapped and Inspected at 68°F.
in air conditioned room which duplicates Bureau of Standards requirements.

BESLY **BESLY-WELLES** CORPORATION
Established as Charles H. Besly & Co. in 1875
128 Dearborn Avenue • Beloit, Wisconsin

CIRCLE INFORM-A-GRAM KEY NO. 34

. . . Month's Talk, from Page 24

the steel-making industry took on greater possibilities for expansion as coal reduced to coke replaced charcoal, and the discovery of oil about 90 years ago provided a broader base for an ever greater industrial expansion.

It is these products of the sun — coal, oil, and natural gas — which have made possible the enormous advances in living standards. And they have made possible the enormous increase in population in this country and throughout the world.

Meantime, man's use of energy has been sharply on the increase, both as to the aggregate and as to use per capita. In 1800 the world-wide consumption of energy in terms of coal was 300 calories a day. This increased to 10,000 calories by 1900. By 1940 energy consumption of coal and now oil, too, was at the world rate of 22,000 calories a day. Here in the U. S., the rate of use of energy from the fossil fuels has been even greater — our consumption approaches 160,000 calories a day.

So great do our requirements for energy in the future appear that it is increasingly apparent that we shall need all the energy sources we can muster. Some considerable ingenuity in this matter already is coming to light. Scientists are trying to figure out lower-cost methods of capturing the sun's energy for heat uses. Other scientists are exploring the possibilities of burning aluminum, magnesium, or boron as high-energy fuels for jet planes and missiles. Combined with hydrogen these and other metal compounds burn fiercely and might find specific commercial uses and so make significant contributions to our energy supplies. Others are exploring the possibilities of harnessing the pull of gravity so that it can be converted into electric power.

Energy from the Atom

But it is atomic energy which promises to make the really important additions to the energy requirements of the future. There is plenty of uranium and thorium in the earth's crust, and the U. S. is favorably situated as regards one of these — uranium. Authorities estimate that the energy locked in these fissionable fuels amounts to between 20 and 100 times as much as in the world's stock of all fossil fuels.

And what about fusion energy? It may be quite a few years off, in terms of our years and experience, but it may be an important energy source at some time in the future. Anyhow, we know that if the technical obstacles are overcome that we need not be concerned about availability of light and fusionable elements. We are assured that the oceans carry enough to satisfy all

. . . Continued on page 42

Customer reports

81% average savings

in Machining Time with . . .

BULLARD

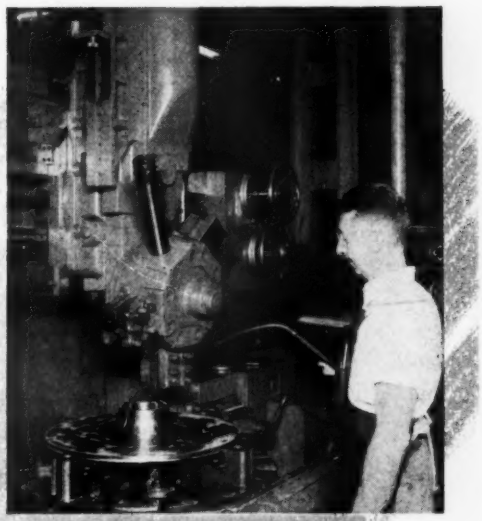
CUT MASTER V.T.L.

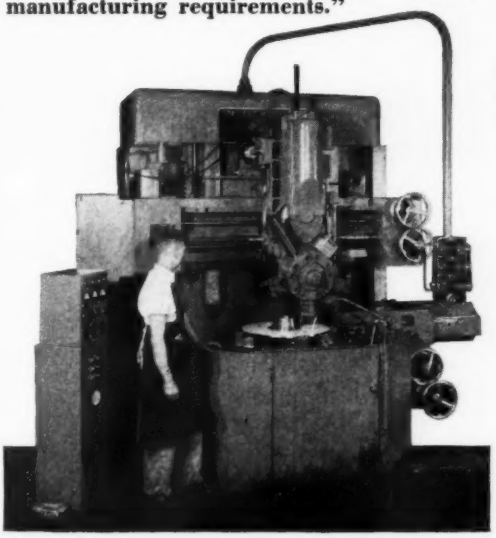
MODEL 75

At the York, Pennsylvania plant of the York Corporation, manufacturers of refrigeration and air conditioning equipment, the new 36" Cut Master is running 24 hours a day machining hubs and covers for a turbo compressor impeller wheel.

They have calculated an 80% savings in machining time on the hub disc and 82.3% on the cover disc. As a result, the overall savings in all manufacturing operations for the turbo wheel amounts to 57.7%.

"The quality of the machined finish that we get with our new Cut Master, Model 75," says Mr. R. P. Feiser, Industrial Engineer, "is of such high standard that hand finishing is not necessary to meet our exacting manufacturing requirements."





These same savings can be applied to your manufacturing cost problems — for full information call your nearest Bullard Representative or mail coupon for Catalog to

THE BULLARD COMPANY
286 CANFIELD AVE.
BRIDGEPORT 2, CONN.

PLEASE SEND ME A COPY OF THE NEW CUT MASTER, V.T.L., Model 75 CATALOG

NAME_____

COMPANY_____ POSITION_____

ADDRESS_____

CITY_____ ZONE_____ STATE_____

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You Get These Exclusive Safety and Handling Features

with all

SUPERIOR DIE SETS

Large Sets No Longer Need Be Blocked . . . Small Sets Can Be Lifted Without Sliding.

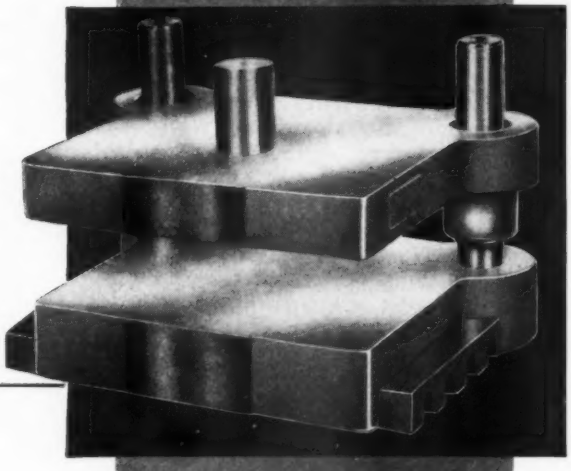
Three features exclusive with SUPERIOR DIE SETS permit rapid assembly, disassembly and overall handling of large and small die sets. In addition they provide safety insurance . . . protection for the skilled hands of die makers and handlers . . . protection also against the ruining of costly dies in handling, or even damaging of valuable press equipment. Write for FREE 24 page Catalog on Superior Die Sets and Supplies.

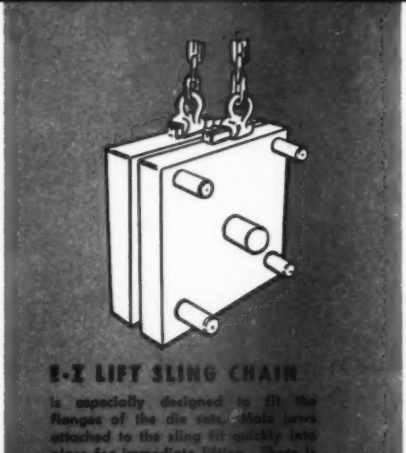
SAFETY FLANGE

protects fingers by providing roomy gripping space on either side of the die shoe.

LOCK-JAW LIFTING DEVICE

removes the danger of handling large die sets. Heavy steel components of this device are welded in place forming an integral part of the die set.





E-Z LIFT SLING CHAIN

is especially designed to fit the flanges of the die sets. Male jaws attached to the sling fit quickly into place for immediate lifting. There is no need for screw clamps, eye bolts, or lifting lugs.

For Fast Local Service Call these Expert Superior Representatives

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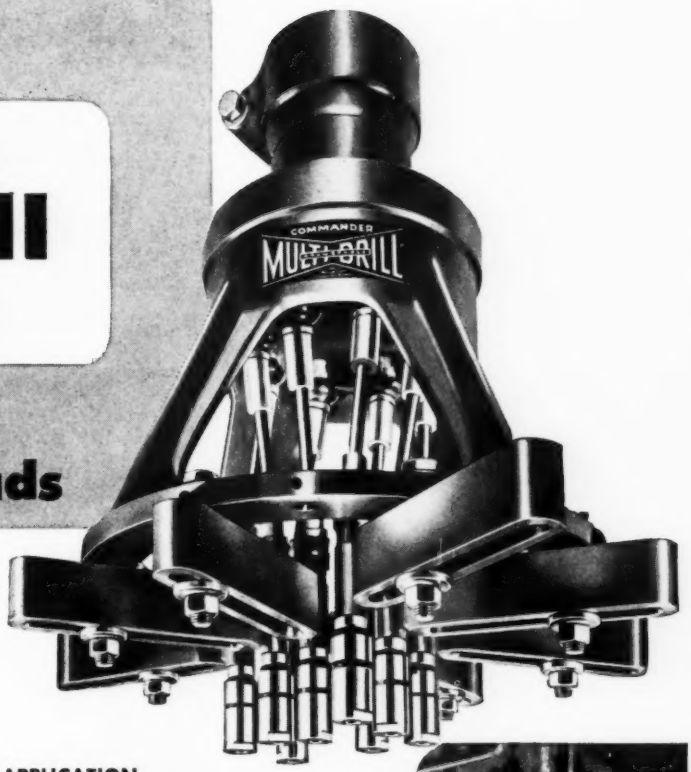
For full details write for our Free Catalog. It contains helpful data on Superior die sets and diemakers' supplies.

SUPERIOR STEEL PRODUCTS CORP.
2754 S. 19th ST., MILWAUKEE, WIS.

WHY is the Commander Multi-Drill the leader among multiple spindle drill heads



GREATER FLEXIBILITY . . . WIDER APPLICATION

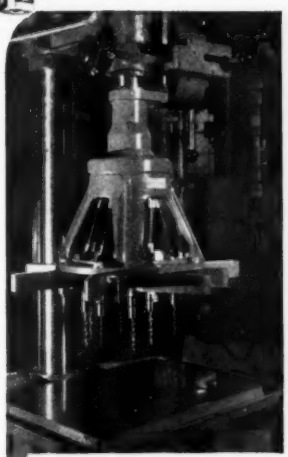
Universally adjustable MULTI-DRILLS—with their many special spindles, extensions, accessories and attachments—will do more drilling, tapping and reaming jobs . . . will handle a wider area with more precision and control—providing maximum tool utility and lowest all around costs.

BETTER PERFORMANCE . . . LONGER LIFE

MULTI-DRILLS are built for high production work . . . components—from the tough high strength aluminum alloy frame to special alloy heavy duty block-type universal joints are selected for strength and durability. Users don't have to "baby" the MULTI-DRILL . . . it's designed and built to do a man-size job.

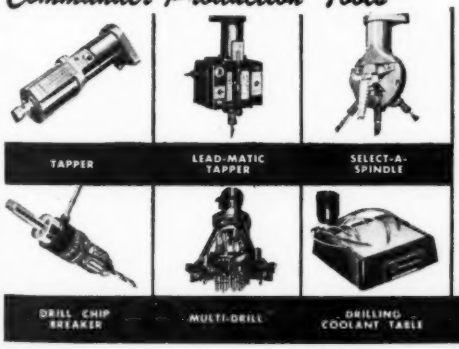
ASSISTANCE AND SERVICE FROM DRILLING SPECIALISTS

If you have a drilling or tapping problem—or merely want to cut your production time and costs, your nearby MULTI-DRILL Distributor will provide competent assistance, complete service and prompt delivery from stock.



MULTI-DRILLS are quickly and easily attached to any drill press—are ready to work in a matter of minutes!

Commander Production Tools



Commander MANUFACTURING CO.

4228 W. KINZIE STREET • CHICAGO 24, ILLINOIS

The Commander catalog has complete information on MULTI-DRILLS and many other cost-cutting production tools. Write for it and the name of your nearby Commander Distributor today.

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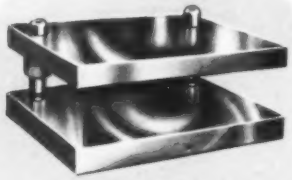
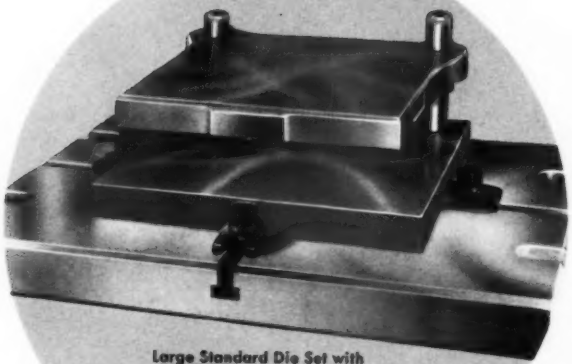
...see it all at the ASTE Show next month in Chicago!



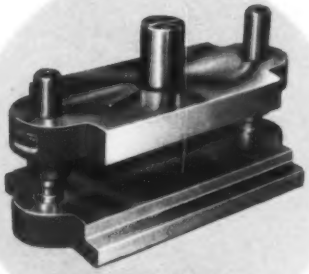
Large Precision All-Steel Die Set with clamping holes shown



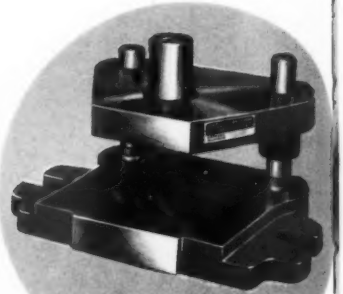
Large Standard Die Set with Semi-Steel Punch Holder and All-Steel Die Holder. New clamping method shown.

ALL-NEW DANLY "L

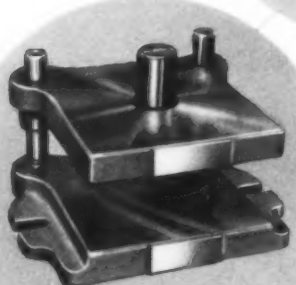
new dimensional standards... new longer life... new features... in



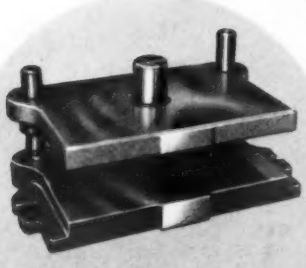
Center Post Precision All-Steel Die Set



V-Punch Holder Precision All-Steel Die Set

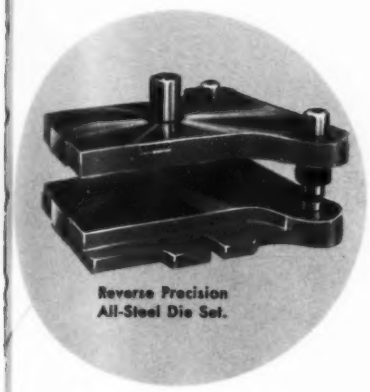


Back Post Precision Semi-Steel Die Set



Long Precision Standard Combination Die Set

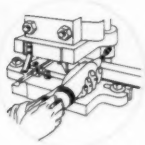
8 Reasons Why Danly Leads The Die-Set Field!



Reverse Precision All-Steel Die Set.

1 Precision chrome plated MICROME guide posts wear longer and are now standard on all Danly Precision Die Sets.

2 Demountable bushings for exceptional degree of accuracy and ease of replacement are available.



3 New oil lubrication system for guide posts and bushings further protects bushings and posts from wear.

4 A complete new line of long and short shoulder Precision bushings of hardened steel . . . long shoulder types also available in hard bronze.

5 Easier faster clamping with Danly All-Steel Die Sets—clamping holes used where left to right dimension is 20" or more.

6 Removal of punch holder made easier. This feature assures easy assembly and disassembly during die making, die setting or regrinding.

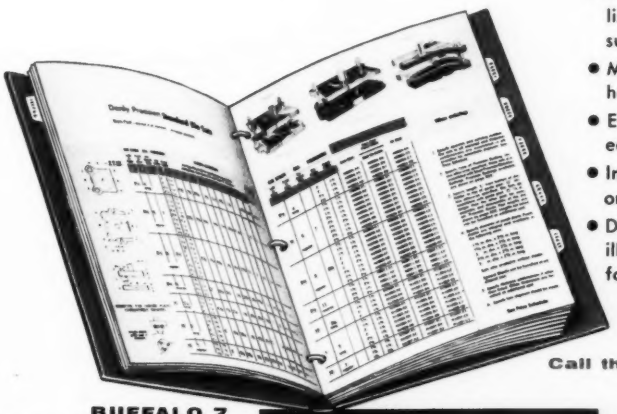
7 Danly meets or exceeds ASA Standards . . . offers many sizes not listed by ASA for a more complete selection.

8 All horizontal surfaces are ground to assure a flat, true working surface.

Y "LEADERSHIP LINE"

ures... introduced in this all new Danly catalog

more than 200 pages of technical information



- The most complete description and listing of die sets and diemakers' supplies available.
- Many new items helpful to diemakers have been added.
- Every page designed and tested for easiest possible selection.
- Included price book simplifies ordering.
- Detailed drawings and photographic illustrations provide handy reference for designers and buyers.

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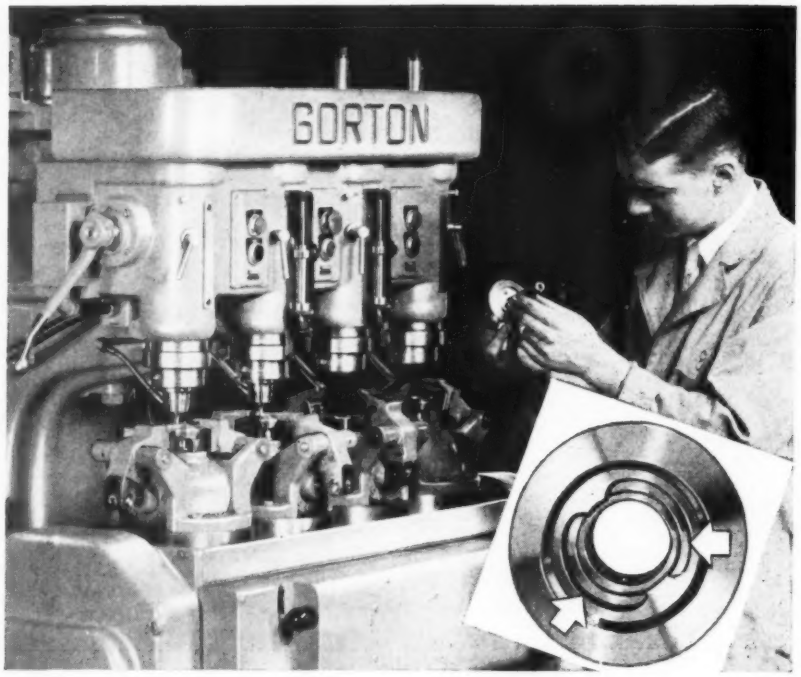

PRODUCTION FACTS: *Mill two locking lug recesses in bevel gear blanks at a rate of 50,000 pieces per month. Material is SAE 4615 cold drawn, 180 to 210 Brinell. All metal is removed in one pass.*

50,000 Monthly Production with GORTON ROTARY DUPLICATOR

Four spindles operate in pairs with their respective rotating fixtures so that the operator unloads and reloads one pair of fixtures while the other two cutters mill two recesses in each of two beveled gear blanks.

Milling operation is mechanical — no electronic, hydraulic or pneumatic controls are used other than air operated clamps.

CAN PERFORM TWO DIFFERENT OPERATIONS AT THE SAME TIME

Each pair of fixtures is controlled by one of two masters mounted within the table. When one pair of spindles is lowered to fixed depth and the cycle starts, the rotation of fixtures and cross movement of table feed the work to the cutters to produce the desired shape.

Due to this feature, one pair of spindles together with their fixtures and single master can perform one operation on two pieces while the other pair performs a different operation on two other pieces.

EASILY MODIFIED TO MEET YOUR NEEDS . . .

Variations of this machine can be designed with additional spindles and more range, with or without variable down feed.

ADDITIONAL TOOLS by GORTON

PANTOGRAPHS

Five models of 2- and 3-dimensional machines for engraving, profiling or die sinking—either manually operated or tooled for automatic cutting cycle operation.

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Three sizes, designed for fine work in the machine shop, tool room and in die and mold shops.

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MACHINES FOR HIGH PRODUCTION

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For multiple operations at production rates with high repetitive accuracy.

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For permanently marking hardened or finished parts.

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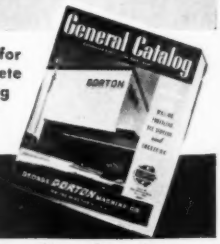

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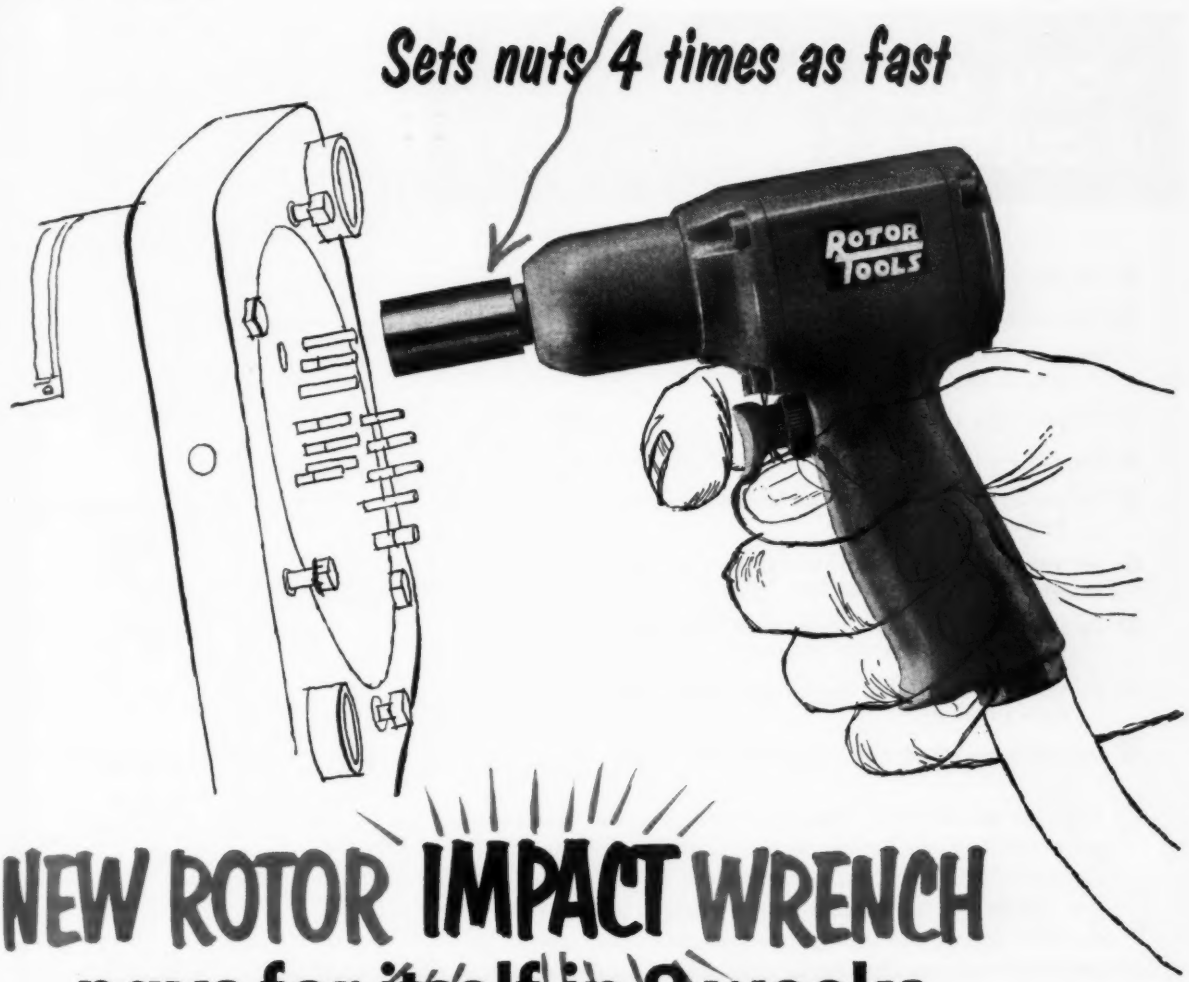

NEW ROTOR IMPACT WRENCH

pays for itself in 9 weeks

JOB: Setting hex and socket nuts in gearless drill heads. Tool used only 25% of productive time.

FORMERLY: By hand. Required 2 minutes per head. Often scored finished surface.

NOW: Use new Rotor J-2 Impact Wrenches. Time cut to 0.5 minute.

RESULTS: 4 times as fast. Savings paid for new Rotor Wrenches in 8.7 weeks. Eliminates scoring of surface.

A demonstration in your shop can show how these new Rotor tools can save *you* money! No obligation. Call your nearby Rotor analyst!

Gives you 2100 solid blows per minute to KO your high costs.

ASK FOR BULLETIN No. 41

CIRCLE INFORM-A-GRAM KEY NO. 41

CAN *You* ANSWER THESE 10 QUESTIONS ON STAMPING?

	YES	NO
1 Do you ever buy stampings on the outside?	☐	☐
2 Do your stampings have to be highly accurate?	☐	☐
3 Do you have more idle press time than you should?	☐	☐
4 Do you have short runs frequently?	☐	☐
5 Do you get less tool life than normal?	☐	☐
6 Do you run into assembly problems due to poor quality stampings?	☐	☐
7 Do you ever have costly delays due to poor delivery on stampings?	☐	☐
8 Do you ever run jobs uneconomically because of improper press size or speed?	☐	☐
9 Do your tools and dies always get expert care from suppliers?	☐	☐
10 Do you ever worry about high storage costs?	☐	☐

If you get too many "YES" answers to these questions, it will pay you to find out how Laystrom can help change those answers to "NO". We have a complete line of presses from 5 to 250 ton for any job from one to a million pieces. We can assure prompt delivery, high stamping quality, and expert maintenance of your dies. We can economically furnish short or long runs — no job is too small. Let us quote on your next job. Send your drawings to Laystrom Manufacturing Company, 2005 North Parkside, Chicago 39, Illinois.

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☐ Have salesman call.
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TOOLS • DIES • ASSEMBLIES • PARTS DESIGN • SHORT-RUN DUPLICATING
Manufacturers of the Layco Tru-Align Die Setup

CIRCLE INFORM-A-GRAM KEY NO. 42

. . . Month's Talk, from Page 34

imaginable energy requirements for thousands of years.

Already $15-billion has been spent or appropriated for atomic energy development here in the U. S., and other countries, including Russia, must have spent the equivalent of a few billion dollars, too, in order to have come up with fission and fusion bombs and with working reactors. We should not forget that fashioning energy in weapons packages doesn't necessarily mean that they will be used for such purposes. Weapons-grade fissionable material could yet find uses for the advancement of mankind, if peace and a peaceful atmosphere could be achieved.

Big Business in U. S.

Atomic energy already is big business here in the United States, although it is almost exclusively a government-owned business. The fixed-plant investment of the AEC installations is much larger than any non-government industrial enterprise in the U. S. or in the world. These plants already require vast quantities of electric power, by far more than is used today in New York City.

And even though it is not yet of large proportions, we shouldn't overlook our growing private industry in atomic energy, such as the individual or corporate-owned uranium mining and milling operations out on the Colorado plateau, or the diversified nuclear instrument business which has been growing at a pretty fast clip.

Let us look for a moment at some of the economic consequences of the already-established energy forms — falling water, coal, oil, and natural gas. Not only did they provide energy and enable man to do things which he had not been able to do before, but they also spawned new industries and in other ways altered and expanded man's economic life. Perhaps the incorporation of atomic energy into our energy stream might also result in new industries and horizons for man, even though we can't visualize or even imagine them at this early date.

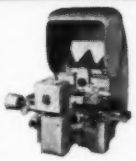
Considering, then, that these energy forms not only have become giant industries in their own right, but have also given birth or at least stimulus and new dimensions to a host of other industries, what can we expect from the atom?

What Can We Expect?

We visualize an atomic industry today more clearly than we could have a few years ago, but we still cannot be positive as to its probable shape and size. We are quite certain that it will be big. The London Economist has called atomic energy "the most challenging technological revolution that man has

DROOBLES

by ROGER PRICE



Bench Model BC-7D

Floor Model FC-30

Floor Model FC-14

"SLIDE RULE ON A BENDER"

This slide rule served my Uncle George well for years, until he gave up engineering to become a full-time horse player. His frantic efforts to figure an unbeatable system made the slide rule just another sad statistic, for it fell a victim of digit-alis. George's number was up, too, because between his wife and his handicapping, he was finally nagged to death.

If *you're* being nagged . . . by difficult inspection problems . . . I can put you onto a sure thing. It's the J & L Optical Comparator, a marvelously precise inspection instrument that inspects and measures all sorts of parts and objects, in a range of sizes.

The J & L Comparator spurs production-line inspection, because it's *easy* to operate, is accurate to .0001", and is incredibly flexible and versatile. Eleven models available. Send coupon today for pay-off information.

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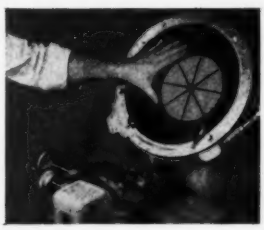
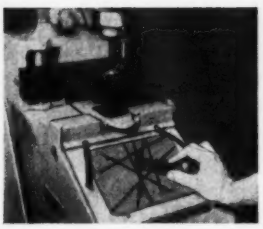
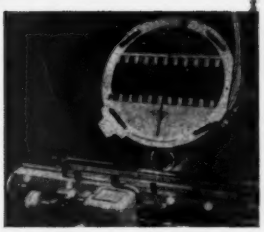
Precise . . . Rapid . . . Flexible . . . Easy to operate



Checking keyway tolerances and hole diameter tolerances, as well as their locations and relationships to one another, in the same operation. Multi-base fixture allows rapid changeover for a variety of parts.



Statistical quality control of glass fibres is easy, using a vertical stage on the J & L Comparator. With 250X magnification, .001" shows as ¼" on the screen, and .0001" as .025". Each fibre is measured instantly to .0001".



Long racks or slotted bars are accurately inspected with the Adjacent Reticle Fixture. A precise scribed glass reticle provides rapid lateral indexing. Tolerance lines on the chart indicate variations in individual dimensions.

J&L. JONES & LAMSON

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CIRCLE INFORM-A-GRAM KEY NO. 44

ever known." Gordon Dean has said that "atomic energy will change the industrial and economic geography of the world."

An economist for one of our large oil companies predicts that by 1975 about 7% of the world's energy requirements will be supplied by nuclear power, and that this will increase to about 25% by the year 2000. By 2050, nuclear energy will represent about 75% of the world's needs. Meantime, the requirements for coal, oil, and gas, and solar energy will have increased by large numbers, though their percentage of the total will have declined.

One of the most important uses of atomic energy — if not the most important — will be a heat source, and this will be primarily for the conversion of water to steam for electric power generation.

Advances in nuclear power technology here in the U. S. and apparently in certain other areas of the world have been real and substantial these past 10 years, with the result that economic nuclear power appears more of a certainty than ever before. The present generation of power plants now being built or about to be built will not get costs down to the 6-mill average for power generated from the conventional fossil fuels. However, engineers and nuclear economists predict that the second or third editions of nuclear power plants will be competitive with the other fuel forms.

The AEC designed and paid the costs of the prototypes of a variety of nuclear power reactors. Now the situation promises to be reversed in that industry is taking on the responsibility of building intermediate, if not full-scale power reactors, and in some instances will have government assistance, and in other instances will not seek such support.

Electric power companies here have announced plans to build almost 1-million kilowatts of electric generating capacity within the next 5 years. By 1965 this probably will be tripled. By 1975, students of nuclear energy estimate that atomic power installations will total between 40 and 80-million kilowatts. By then nuclear power will have proved itself and capacity of atomic plants will double or triple within the following few years so that by 1980, the installed nuclear plant capacity will be greater than is today's total of conventional powered plants.

Britain is embarking upon an ambitious nuclear power program. She is scheduling 1.5 to 2-million kilowatts of electric power by 1965 and by that date will be meeting ¼ of her total requirements for new generating capacity. By 1975 her installed nuclear power capacity will be 10 to 15-million kilowatts.

. . . *Continued on page 48*

"One of the best money-making tools in our shop"

Forming cylindrical sections 8' 0" long, 5' 0" diameter from ⅜" steel plate.

With a Steelweld Press in your shop, you can handle almost any kind of a metal-forming job put up to you. Large heavy cylinders for buckets, drums, boilers, etc., are easily formed with standard bending dies.

You will find Steelweld Presses extremely versatile machines. With various jigs, dies and tools available, and others that can be developed for special purposes, a wide range of work can be performed on steel, aluminum, and the many alloy metals.

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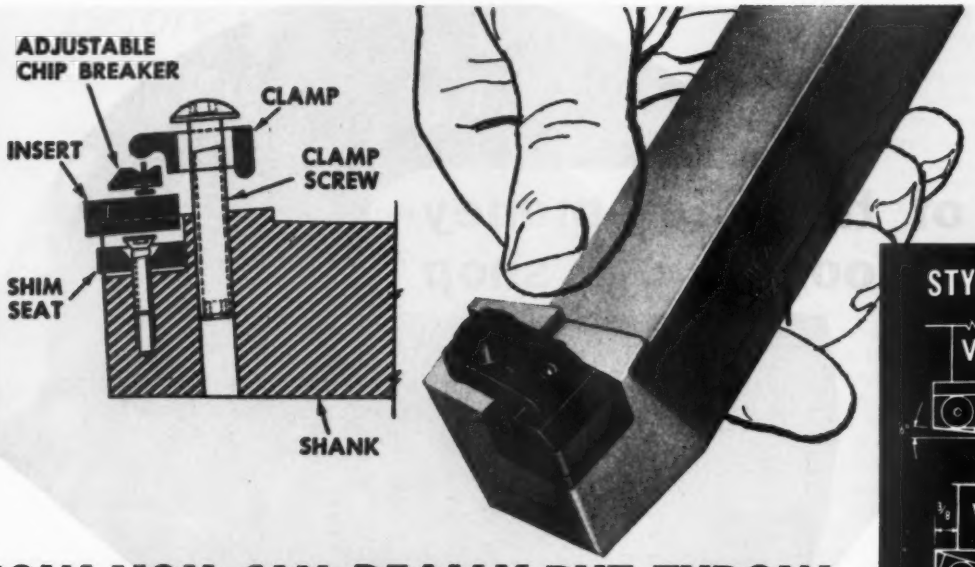

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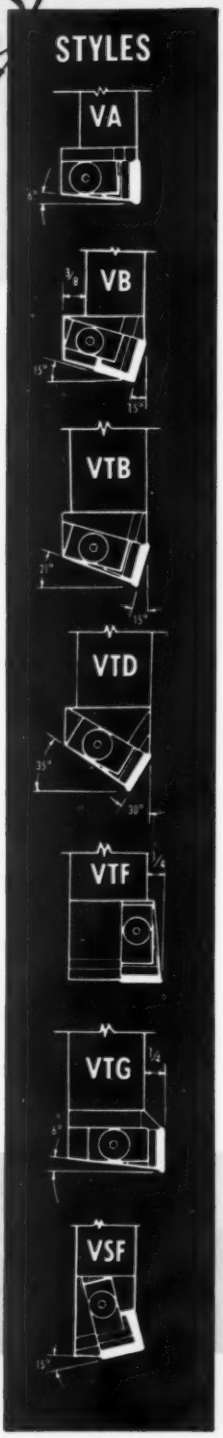

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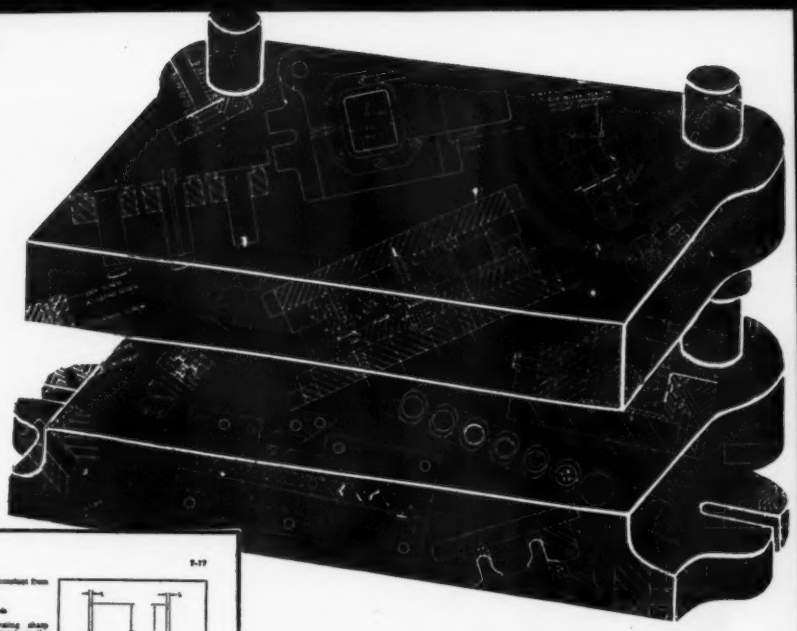

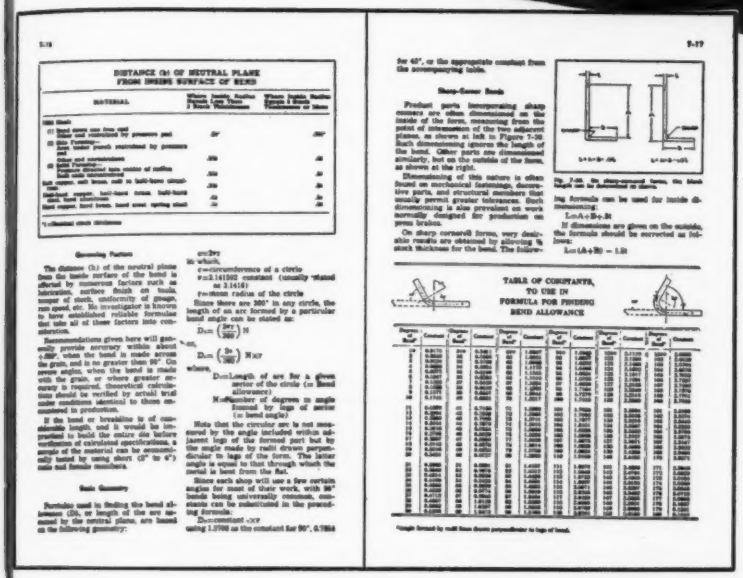

DISTANCE (h) OF NEUTRAL PLANE FROM INSIDE SURFACE OF BEND

TABLE OF CONSTANTS, TO USE IN FORMULA FOR FINDING BEND ALLOWANCE

368 pages, 26 chapters, over 400 illustrations, charts and graphs. 165 Practical Points in Die Design and Construction. Comprehensively indexed.

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CIRCLE INFORM-A-GRAM KEY NO. 48

. . . Month's Talk, from Page 44

Other Uses for Reactor Heat

There are other uses for heat from the reactor. Buildings at the AEC's plutonium producing installation at Hanford, Wash., are using by-product heat from reactors, which suggests that space heating for commercial or closely-populated living areas might be economic. Then there is industrial heat, for metallurgical, chemical, and other purposes. Heat from the fissioning process is in the very high temperature ranges, and if the technical problems of containment and heat removal should be overcome there might be some interesting and useful applications of temperatures well above those now employed.

The Atomic Industrial Forum several months ago conducted a survey of growth prospects in the nuclear power field. This study was completed and published earlier this year. Its conclusions were that industry and government will spend between $4.5-billion and $10-billion in the decade 1955 to 1965 for nuclear reactor plants and related research and development. It broke down the more optimistic figure of $10-billion into $7.5-billion for reactor plant construction and $2.5-billion for research and development.

This study anticipates an increasing expenditure to a point where by 1965 the annual rate may be on the order of $2-billion a year. This is money being spent on atomic energy for constructive purposes and is equal to what is being spent today on the government's total atomic energy program, which continues to be primarily directed at weapons development.

The Growth Survey estimates that the manufacture of components for reactor plants may be over a $700-million-a-year business by 1963. Reactor vessels and internals may amount to $120-million; control apparatus, $80-million; heat exchangers, $70-million; pumps, $104-million; valves and fittings, $40-million; tanks and auxiliaries, $30-million; instrumentation, $70-million; and fuel handling, $60-million.

We of the Forum believe that these projections are conservative. Events since the survey was completed indicate that industry is becoming involved to a greater extent than we had visualized. I might add that the Forum plans to update this growth survey from time to time so that industry might have a better estimate of what lies ahead.

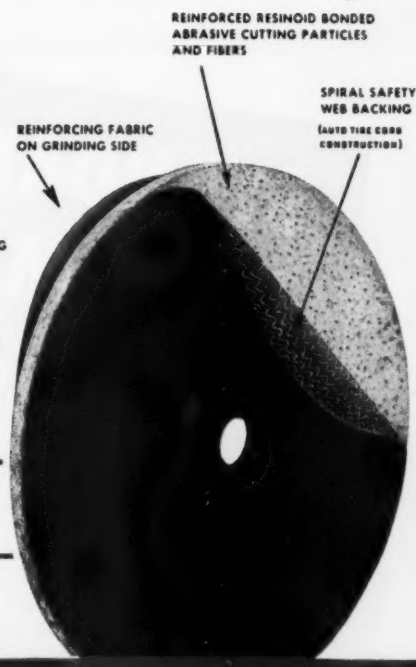
Radiation Possibilities

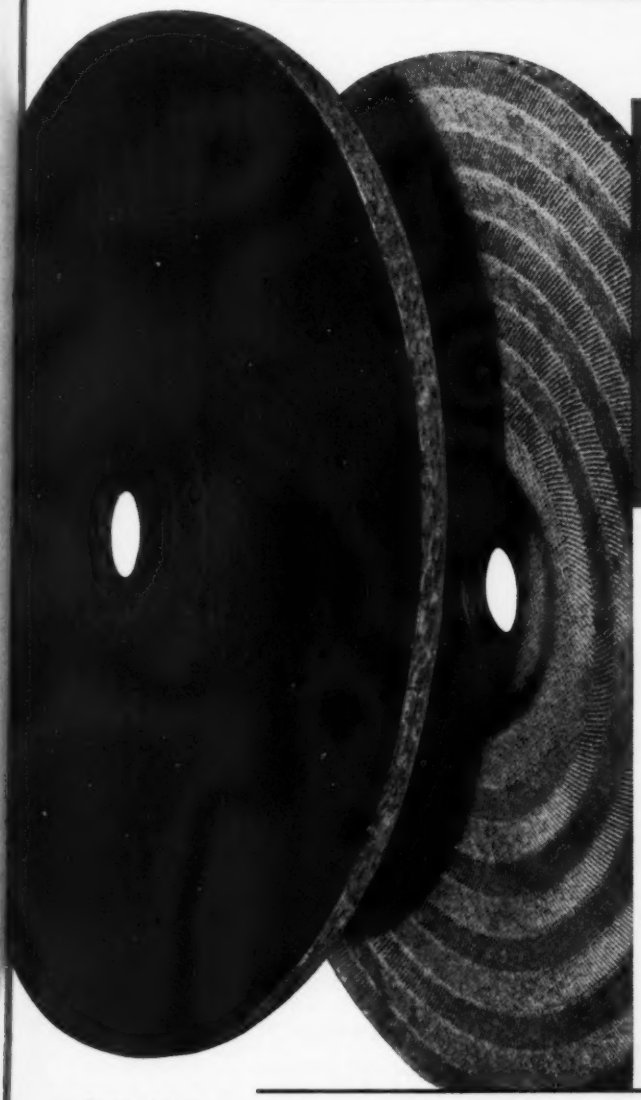
A second product of the fissioning process is radiation. The particles and rays bursting from the splitting nucleus appear to have a wide variety of uses, and a great deal of work has been done, but a great

STRUCTURALLY DIFFERENT...

FOR EXTRA STRENGTH

EXTRA SAFETY


REINFORCED RESINOID BONDED ABRASIVE CUTTING PARTICLES AND FIBERS
SPIRAL SAFETY WEB BACKING
(AUTO TIRE CORD CONSTRUCTION)
REINFORCING FABRIC ON GRINDING SIDE
GRINDING EDGE



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New

SIMEX® RED WHEEL

SIMONDS ABRASIVE CO.

For rough, tough production grinding—welds, removing flash and bead; cleaning up rough ragged surfaces and edges. This new lightweight rigid type reinforced resinoid bonded abrasive wheel can give you sensational savings. Use Simex on portable disc type and right angle type portable grinders. Depressed center or raised hub shape; 7″ and 9″ diameter x 3/16″ and 1/4″ thickness.

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SIMONDS ABRASIVE COMPANY • PHILADELPHIA 37, PA.

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CIRCLE INFORM-A-GRAM KEY NO. 49

STANDARDIZED AUTOMATION!

Standard 12 stop Intermittor with specially jig-bored 36" dial.

PRECISION INDEX TABLES FOR HIGH SPEED PRODUCTION

CAN YOUR PRESENT MACHINERY PRODUCE 30,000 PIECES AN HOUR?

Few production machines can . . . but it's possible with the Ferguson Intermittor Index Table. There are models capable of 30,000 indexes an hour if your machinery and tooling can keep up with them. The point is . . . *the Intermittor does not limit the speed of your machinery the way geneva driven or air or hydraulic operated tables do.*

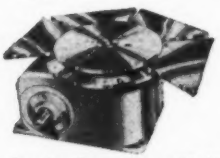
Perhaps speed is not your problem, but excessive maintenance costs are . . . resulting from the clanging, banging and jarring you get from a geneva drive. Here again you find the solution in an Intermittor. Employing modified trapizoid acceleration characteristics, the Intermittor has an initial acceleration point of zero with a gradual increase to the maximum and an equally gradual decrease to zero again . . . *all of which means that the Intermittor is a smooth operating table with minimum shock and vibration.*

Or maybe you like accuracy . . . but don't like shot pins. The Intermittor Indexing mechanism has an accuracy of .001" with zero backlash — *and no shot pins!*

There are many more reasons why you should install an Intermittor when you need a rotary table for large volume production, including the fact that you can select one of 150 standard models from a catalog and get exactly what you need in terms of dial size, number of stations and indexing period.

OVER 150 STANDARD MODELS TO CHOOSE FROM:

Standard 24 station Intermittor with 30" dial and optional stationary tooling plate above the dial.



6 station Intermittor with 12" dial and special tool mounting brackets.

Standard 18 station Intermittor with 48" dial.

Send for our Catalog No. 300 . . . it has a definite place in your file if you have the responsibility of speeding up production or converting to automation.

ferguson

FERGUSON MACHINE & TOOL CO., INC.

ROLLER GEAR DIVISION, DEPT. HI-2 P. O. BOX 5841, ST. LOUIS 21, MO.

CIRCLE INFORM-A-GRAM KEY NO. 50

deal more needs to be done before all the commercial applications are fully explored. But enough has been found and are currently being employed to justify optimism on this sector.

We have heard it said that the use of radioisotopes as a research tool represents the greatest advance since the discovery of the microscope. As a research tool and by virtue of many other uses, in medicine, agriculture, and industry, isotopes might come to have great economic value. Dr. Glenn T. Seaborg of the University of California, the discoverer of two of the three fissionable elements, U-239 and U-233, says that in the long run the use of radioisotopes might be more beneficial than the development of nuclear industrial power.

Radioisotopes already have many applications in industry. As tracers they indicate the flow or position of gases or fluids, or the distribution of specific elements in a mixture. Dr. Eger Murphree of Esso Research & Development says that a scientifically verifiable martini can be made on a three to one ratio — three railroad tankcars of gin and one drop of vermouth. If the vermouth is tagged with a radioactive element and if the two substances are well shaken in some outsize container, you would have — and could prove you had — a real and authentic and certainly a dry martini.

Radioisotopes can be used to look into metals and materials to locate flaws, or as thickness gages to measure a wide variety of products on moving production lines. Thickness gages are used in many industries and are saving thousands or hundreds of thousands of dollars in literally scores of plants.

Radioisotopes used in these industrial applications are helping to lower costs and to bring about better quality. In instances they enable a manufacturer to change the design or construction of products and thereby obtain a better or lower-cost item. They help to increase production. They contribute in the development of new products.

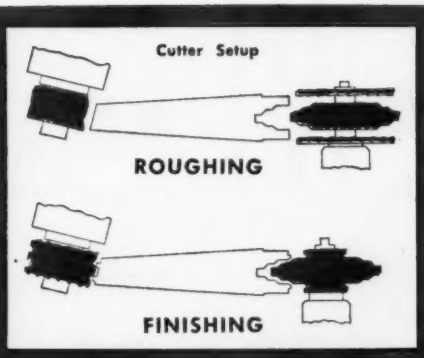
Radioisotopes are putting a question mark on all things material They ought to cause every busines executive to question the researc and manufacturing practices of his company, because things are going to be different. The engineering textbooks of a few years ago are obsolete. Change is getting to be more and more a permanent fixture in our body economic.

Looking Forward

Earlier I referred to the development of the reactor as a heat source for electric power generation. In doing so I was thinking of nuclear

CUSTOMER SPECIFIED

KEARNEY & TRECKER MILWAUKEE DESIGNED



A leading electrical equipment manufacturer needed a production machine to rough-and-finish mill a variety of sizes of chrome-nickel-steel steam turbine blades — 4" to 30" long. Specifications called for a machine that would cut milling costs and maintain accuracies within the limits of the job. Solution: They called on Kearney & Trecker to develop and build the machine.

Production rates are dependent upon workpiece size. For example, twenty-seven 13½" chrome-nickel-steel blades are rough-and-finish milled per hour by this new Kearney & Trecker Two-Spindle Bed Type machine.

Rectangular index table with two work-holding fixtures enables the operator to unload and load one fixture while the other is in work. This sequence eliminates down-time and keeps production constant.

Dovetail end of blade is rough-and-finish milled with the lower spindle, using a combination of special form and side mills. Head, mounted in an inverted position on a saddle, is counterweighted. Tenon end of blade is milled with the upper vertical head which moves in an arc on radial ways . . . angular adjustment of 45° is possible.

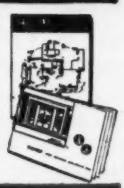
Other machine features include air-clamping for machine table . . . automatic chip conveyor . . . high volume coolant pump . . . easy to change pick-off gears for each head to select exact desired spindle speeds.

New production efficiency starts with Kearney & Trecker Milwaukee machine tools

Kearney & Trecker automatic production machines perform many operations to exacting accuracies and at lower cost. But most important to you — it's accomplished by combining standard design components with a minimum of special engineering. This means you get the production you want, the economies you need, from job-proven designs with minimum of capital investment.

With more than 50 years' experience in machine design and manufacture, Kearney & Trecker has the all-around ability to meet your production needs. Take advantage of these abilities. They can pay off in lower machining costs and more profits for you. See your Kearney & Trecker Special Machinery Division representative. He'll be glad to help you with your production requirements. Call him today.

For more details on machine illustrated ask for Data Sheet No. 1067. Booklet "Doorway to a proven method for solution of big and small metalworking problems" is also yours for the asking.



KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

Special Machinery Division

MILWAUKEE 14, WISCONSIN, U.S.A.

Builders of Precision and Production Machine Tools Since 1898

CIRCLE INFORM-A-GRAM KEY NO. 51

NEW! BAUSCH & LOMB WIDE FIELD MACROSCOPES 10X to 40X

Handy 'scopes spot-check production, speed small parts work

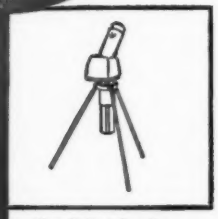
- **Actual size as shown here ... compact, handy**
- **Shows natural right-side-up views... easier for inexperienced users... a big help in precision assembly!**

Just grab this dependable inspection aid for on-the-spot checks of work and materials in any phase of production. Available with folding tripod or sturdy microscope stand, for detailed study and for small-parts assembly. You can even build it right into production machinery!

Upright images are sharp and detailed to the very edge of the extremely wide field of view. Long working distance makes it easy to manipulate specimens ... gives operators plenty of room for precision assembly and repairs. (Also available as straight tube for applications where upright image is not required.)

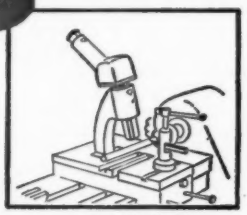
FREE DATA BULLETIN!
ON-THE-JOB DEMONSTRATION!

Find out how this inexpensive production tool can lower your manufacturing costs. WRITE, WIRE or PHONE today for free demonstrations and Data Bulletin D1052. Bausch & Lomb Optical Co., 79802 St. Paul St., Rochester 2, N. Y. (Phone: LOcust 3000).



Use it in tripod...

In microscope stand...



...or even built into machinery!

BAUSCH & LOMB
SINCE 1853

AMERICA'S ONLY COMPLETE OPTICAL SOURCE
... FROM GLASS TO FINISHED PRODUCT

CIRCLE INFORM-A-GRAM KEY NO. 52

power as a supplement to our established electric power industry.

But let us think for a moment of the possible consequences of nuclear power in high fuel cost areas in the United States and in other parts of the world. Nuclear fuels take up little space and their weight, compared to conventional fuels, is negligible. That means that any area of the world which needs and can use electric power at a cost of say 9 mills or thereabouts can have it, and within another few years probably can buy it cheaper.

This means that industry or populations will no longer be anchored to fuel deposits. At some not-too-distant date an aluminum mill or any other business requiring large quantities of power can have that power wherever it wants it, and therefore other economic factors such as raw materials, or access to markets, will influence or dictate industrial location. This has, of course, very great economic implications.

The nuclear reactor also has opened up new and interesting possibilities in the seas and in the air. The submarine Nautilus fires the imagination. As you know, something like two tons of oxygen are consumed for every ton of oil or coal. Conventional submarines, then, can remain submerged only for relatively short periods of time. It is said of the Nautilus that it needs to surface only to permit the crew to re-enlist.

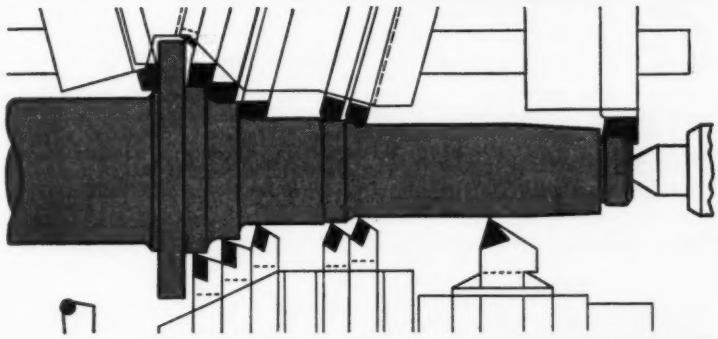
Is it not possible that a nuclear reactor may have many possibilities for underseas work, particularly when we consider that the oceans may be our next vast source of metals and chemicals? Perhaps we haven't mined the oceans because we didn't have the tools. Why couldn't we descend to great depths with the help of the reactor, or why couldn't the reactor provide energy which could separate materials or otherwise perform some economically useful function in the ocean's waters?

And perhaps the reactor will enable us to do much in the air. Research and experimental work in powering aircraft has been quite successful, and we are told that the time is not far off when nuclear powered planes will be flying. If such planes have commercial possibilities, how will they influence travel, and what effect will they have on living standards and the distribution of populations? And what about nuclear-powered dirigibles? And what about space travel using nuclear energy?

It is important to realize that we don't see all that is going on in atomic energy development for constructive uses of the atom. Secrecy no doubt enshrouds some potentially significant commercial applications.

. . . *Continued on page 98*

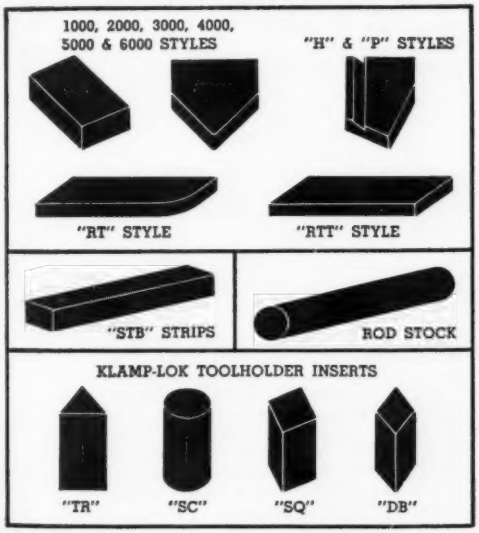
THE TURNING POINT TO HIGHER PROFITS!



PRODUCTION RATE—UP 25%, TOOL COST—DOWN 40% AT LARGE MID-WEST TRACTOR PLANT

PART.....Shaft Steering Clutch, SAE 8654-H Brinell 370.
OPERATION.....Rough Straddle Face Flange, turn all diameters, form undercut and base.
MACHINE.....16 x 40 Sunstrand Automatic Lathe.
TOOLS.....8 Talide-tipped facing, chamfering, radius and form tools Grade S-88. 7 Klamp-Lok Toolholders with round, triangular and parallelogram Talide inserts Grade S-88.
DEPTH OF CUT..9/32" to 7/16"
FEED.....022
S.F.M.....156
RESULTS.....Production up 25%—Scrap and rejects down.

A FULL LINE OF TALIDE TIPS IS AVAILABLE IN OVER 1000 SIZES, STYLES, SHAPES AND GRADES—TO MEET EVERY MACHINING REQUIREMENT



NEW IMPROVED CUTTING GRADES

An extensive 2-year research and development program has resulted in a completely new and improved series of Talide Metal grades for all-purpose machining. "Double-carbides" containing tantalum carbide and tungsten carbide have been perfected for cutting cast iron and non-ferrous alloys, and "triple-carbides" containing tantalum carbide, titanium carbide and tungsten carbide for machining steels.

Major improvements have been made in our rigidly controlled vacuum furnace technique. This, along with additional refinements in our process has resulted in the creation of a carbide having a new, unique grain structure possessing harder and tougher properties than previous grades.

Laboratory tests reveal that these new, improved grades have 25% greater strength and rigidity. Extensive field tests have proven that service life per grind is increased up to 50% over previous grades. **Metal Carbides Corporation, Youngstown 7, Ohio.**

Send for new 84-page Catalog No. 55-G.

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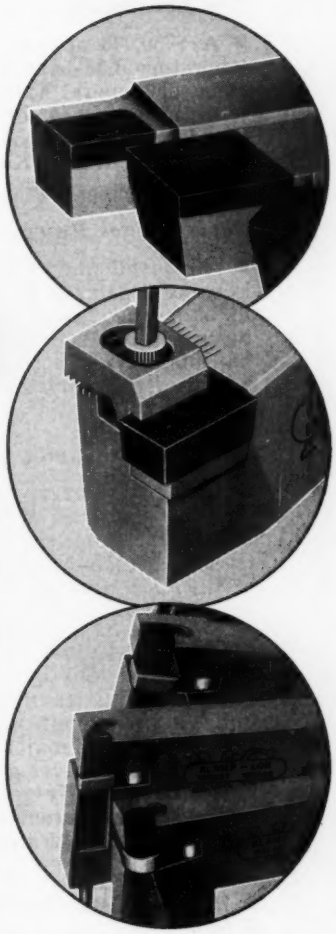

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HEAVY METAL · CERMETS · HIGH TEMPERATURE ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

CIRCLE INFORM-A-GRAM KEY NO. 53

MANUFACTURING MEMOS

New Laboratory . . .

● A $750,000 applied research and development laboratory has been established by the Foundry Dept. of General Electric Co., in Schenectady. It will deal with problems and processes essential to the foundry business. The laboratory will be headed by Dr. Jack Keverian.

Departmental Reorganization . . .

● All development work at Jack & Heintz, Inc. is being organized into two major divisions, each to be headed by a chief project engineer. The posts will be filled by Omar C. Walley and Robert G. Dobbin. The activity is a part of the reorganization of the firm's engineering department.

New ASTE Committeeman . . .

● James R. Weaver has been elected a member and vice chairman of the Research Fund Committee of the American Society of Tool Engineers. He is manager of manufacturing and engineering at the East Springfield, Mass., plant of Westinghouse Corp.

● Walworth Co. has acquired Conoflow Corp., Philadelphia, a leading producer of pneumatic automatic valve control equipment. This acquisition is the fourth major one for the company which manufactures valves and pipe fittings. Walworth will now intensify research in the development and design of automatically-controlled valves in the general field of automation.

● Pressed Metal Institute has won the National Safety Council award for outstanding work in reducing the accident frequency rate in stamping plants.

● Sargeant & Wilbur, Inc., of Pawtucket, R. I., is planning to formally enter the export market. The firm manufactures a complete line of electric and fuel fired industrial heat treating furnaces, atmosphere generators, ammonia dissociators, and gas conditioning equipment. Masten-Wright Corp. will serve as export managers.

● Square D Co., Detroit, and Electric Controller and Mfg. Co., Cleveland, are being merged. As a result, Square D, the surviving corporation, will become one of the nation's largest manufacturers of electric motor controls. A. G. Patterson will serve as president and F. W. Magin, as board chairman.

Mag-Electric Products, Inc., of Hawthorne, Calif., has been acquired by National Aircraft Corp., Burbank. The new subsidiary manufactures magnetic amplifiers, power supplies, delay lines, electronic test equipment, and transformers. This purchase is part of National Aircraft's expansion in the electronic component field.

◆

Stanek Tool & Mfg. Co. has changed its name to Stanek Tool Corp. The company produces dies, jigs, fixtures, plastic molds, die casting dies, and special machinery.

◆

Van H. Leichliter was recognized by the American Standards Association for "leadership in advancing the development and use of voluntary standards as instruments of free enterprise." He is vice president of the American Steel and Wire Div'n, United States Steel Corp.

◆

United Pipe Column & Railing Co. will be operated as a division of Solar Steel Corp. as a result of a recent acquisition. Solar Steel is a steel warehouse and processing organization.

◆

Vulcan Crucible Steel Co. Div'n, H. K. Porter Co., Inc., tool steel manufacturer, recently opened a warehouse and sales office in Cambridge, Mass.

◆

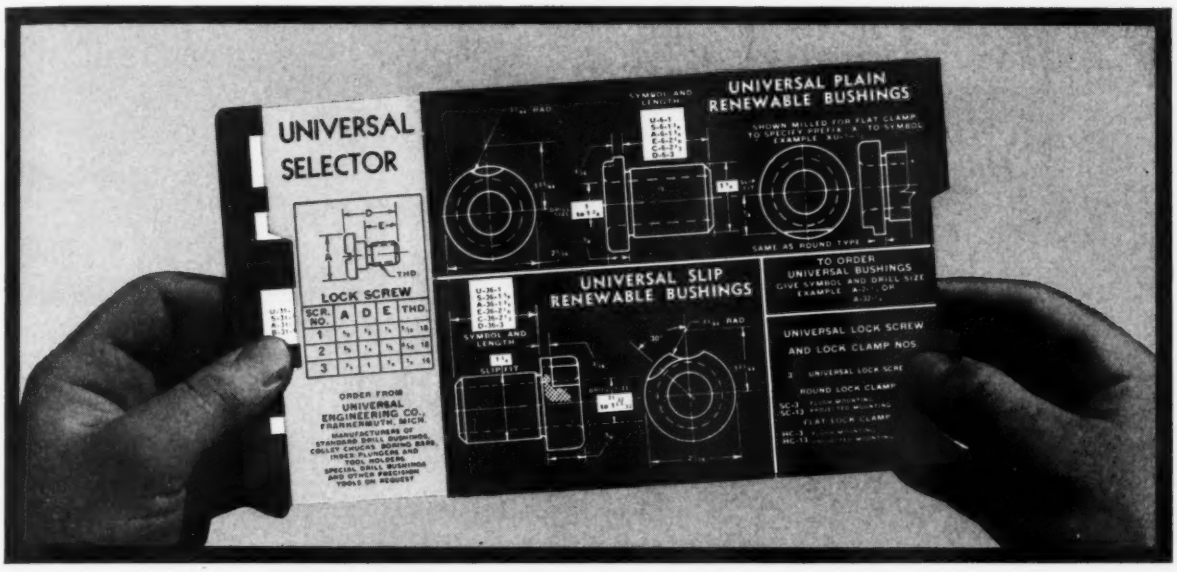
A Pittsburgh steel forgings manufacturer, Heppenstall Co., has bought the physical assets of Midvale Co., Philadelphia. To operate the plant, a new corporation, Midvale-Heppenstall Co., will be set up. Midvale manufactures heavy steel forgings, particularly ordnance materials. With this purchase, Heppenstall has become the nation's largest manufacturer of heavy forgings.

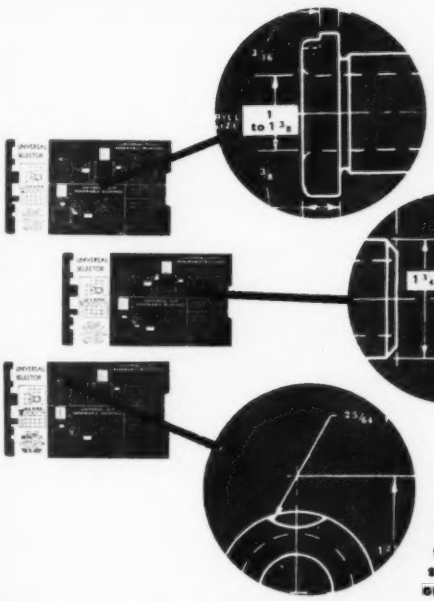
◆

A multi-million dollar contract to manufacture J-57 parts for the Air Force's principal jet engine program has been awarded to Studebaker-Packard Corp. The project will result in a 20% increase in employment in the company's Detroit area plants.

HOW THE UNIVERSAL DRILL BUSHING SLIDE CHART SIMPLIFIES JIG DESIGN

new plastic, pocket-size calculator gives all engineering data for the selection of all types and sizes of drill jig bushings up to 1¾″ drill size





The SELECTOR is divided into four areas, one for each of the four types of bushings. The example shown here is for the plain renewable. Using this area, you move the slide until the correct drill size appears in the drill-size window.

Once the drill size is set up on the SELECTOR, all other factors now appear in the windows. This section, for example (shown actual size) shows correct bushing O.D. and dimension from center to flat for clamp.

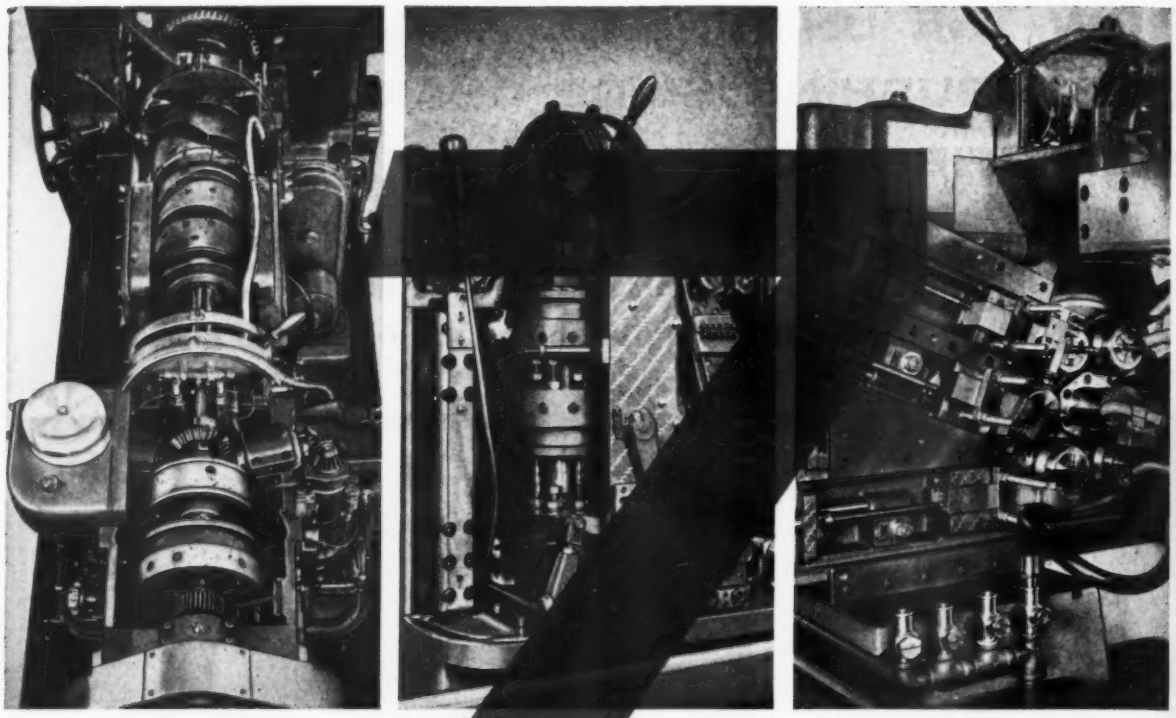
This section shows the radius for lock screw. Every factor you need for drill bushing jig design as well as for ordering the correct bushing to fit that design is shown correctly, exactly, and at a glance on the SELECTOR.

A new service to regular users of drill jig bushings is this extremely practical plastic Selector slide-chart. When designing jigs, you will save many hours, and be certain of your accuracy, with the SELECTOR. It represents the result of six years experimentation and research by Universal Engineering Co. If you are an engineer specifying bushings and do not have one of these slide calculators—you can have one for your own design work by simply requesting it on your company letterhead. Don't wait—do it today!

193

UNIVERSAL ENGINEERING CO. FRANKENMUTH 8, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 55

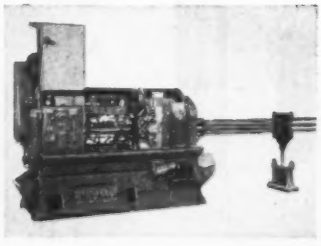


Seven Fast Changeover Models

With the prospects of improved tool materials ever decreasing the actual machining time of work on Multiple Spindle Automatics, long runs tend to become short runs. Facility that decreases the time for job changes becomes more important to low-cost production.

Conomatics are available in as many as seven fast changeover models. These are the 9/16", 1", 1⅝" Sixes, and the 2⅝", 3½", 5", and 5¼" Fours.

These models are equipped with dial adjustment of working stroke of all slides, without making necessary change of total stroke or positive stop settings. Write, wire, or phone for literature descriptive of these features and other facilities available to users, or prospective users.



Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U.S.A.

CIRCLE INFORM-A-GRAM KEY NO. 56

Never before **such an assemblage!**

28,351* cost-cutting production-boosting ideas and products

All in one building
All on one floor

See the 487 most useful and important tooling developments — one to each exhibit . . . They are the cream of more than 28,000 outstanding manufacturing products and processes to be shown.

(*by actual report of exhibitors)

including 453 487

BLUE RIBBON TOOLING CHAMPIONS

at the

1956 ASTE INDUSTRIAL EXPOSITION

International Amphitheatre
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AMERICAN SOCIETY OF TOOL ENGINEERS
10700 PURITAN AVENUE • DETROIT 38, MICHIGAN

Never before...

Such complete all-industry conferences on advancements in tooling and production methods held anywhere in the world! Of vital interest . . . presented by leading experts in research and development who will be available for questions about your own operations . . .

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- Working the Wonder Materials
- What's New in Grinding?
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  (latest information on the use of diamonds in industry . . . actual diamond workshop in action, co-sponsored by Armour Research Foundation)
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- Electronic Calculators and the Tool Engineer
- Automation Tolerances Affect Jig and Fixture Design
- The What and How of Surface Finish
- Automation—You Can Afford It!
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Not again . . .

—for two years will you be able

✓ **to attend such top level conferences**

and at the same time

✓ **to inspect 28,351 products such as these**

(many never before shown anywhere)

These samples and many thousands more to be presented by more than 480 exhibitors . . .

. . . BLUE RIBBON TOOLING CHAMPIONS

at the

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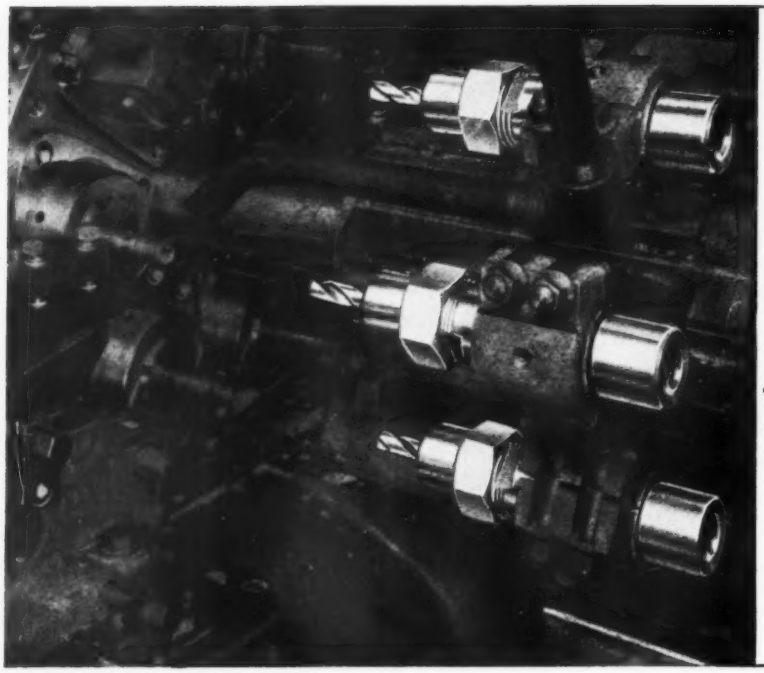

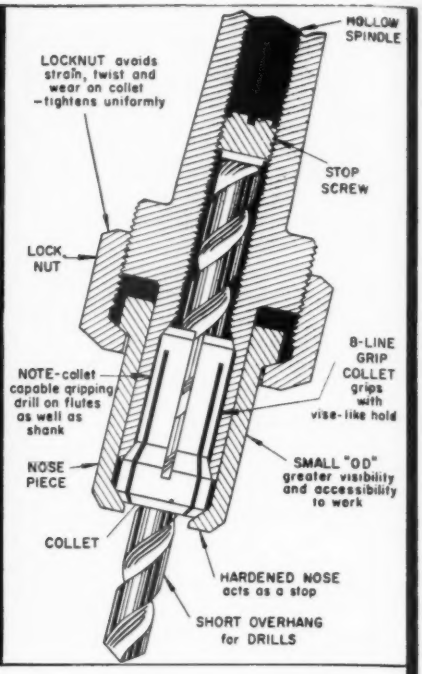
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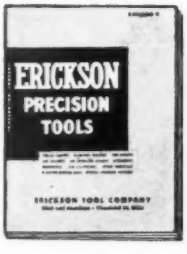

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engineers should sprout in high school

Today it is of common knowledge and concern that there are not enough engineers to meet industry's demands. Many factors have brought this about, but to review them would be too much like crying over spilt milk. Any way such a review could be presented would only head up the fact that the situation is destined to get worse before it gets better.

First and foremost, it is essential that we fully appreciate the critical relationship existing between industry's growing need for engineers and our public educational systems' ability (or lack of ability) to fill that need.

Keeping in mind the rapid advances of science in atomic energy, guided missiles, and automation, to name but three, education's leaders must be constantly alerted to the need for providing educated manpower of adequate quality and quantity to implement our advancing technology.

There are two selling jobs to be done. The school authorities have to be sold on so packaging their educational wares that young talent may be attracted to an engineering education. And, young talent must be sold on an engineering career, not when about to enter college but while in high school.

It is the high school educator who must assume the responsibility of inspiring and drawing out that latent talent which has the making of an engineer. To do this will require a revamping of basic science teaching methods and a consequent increased enrollment in the basic science courses in high schools.

Why are first year college courses in physics and chemistry so difficult? Because, too many of the students have not been given the basics of physics and chemistry in high school.

For those of us whose high school years were permeated by the "aroma" of sulfur dioxide wafted from the school's chemistry lab, it is difficult to realize that half of the nation's high schools no longer offer chemistry, and that 53% do not offer a course in physics. Since 1900, the percentage of high school students who take algebra has dropped from 56% to 24.6%.

The decline in the study of physics, the strategic importance of which in our national life and security is increasing virtually daily, is almost unbelievable. According to the National Education Foundation, the percentage of high school students who enroll in physics has dropped from 22.8% in 1895 to only 5.8% in 1948.

Since physics usually is studied only by seniors this means that more than 75% of the present high school population has never had contact with this subject and thus, probably, never will. This, when physicists are so essential to the fullest peacetime potentials of our atomic age.

To the teen-age high school student physics and chemistry have become, seemingly, very boring and uninspired studies. Surely, the subjects themselves, wrapped up as they are in the technological fascinations of our daily lives, are far from dull and boring. Must it not be, therefore, the teaching tools and methods which have fallen by the wayside?

The high school science teachers' offerings are in competition with the great growth of scientific hobbies engaged in by our teen-age population. To a great extent, the existence of these extra-curricular activities evidence the students' flight from the staid and mundane confines of the traditionally-styled elementary science textbook. In other words, teaching methods and texts have not kept pace with the technological advances which have become commonplace to the student's out-of-school environment.

The remedial measures that can be taken to relieve this situation lie within the province of our secondary school authorities, instructors and administrators. Their action can be greatly aided and abetted, however, by understanding and cooperation from industry leaders, the technical press, parents and teachers associations, and college entrant officials.

The more that interest can be generated at the local level, the more widespread will be the recognition of the need for meeting this challenge to the basic training of tomorrow's scientists. If you belong to a local parents and teachers group, why not put a few questions during your next meeting as to the status of the physics and chemistry teaching and enrollment in your local high school?

The chances are that the very answers to your questions will, in themselves, suggest a course of much needed action.

E. Willard Pennington

editor

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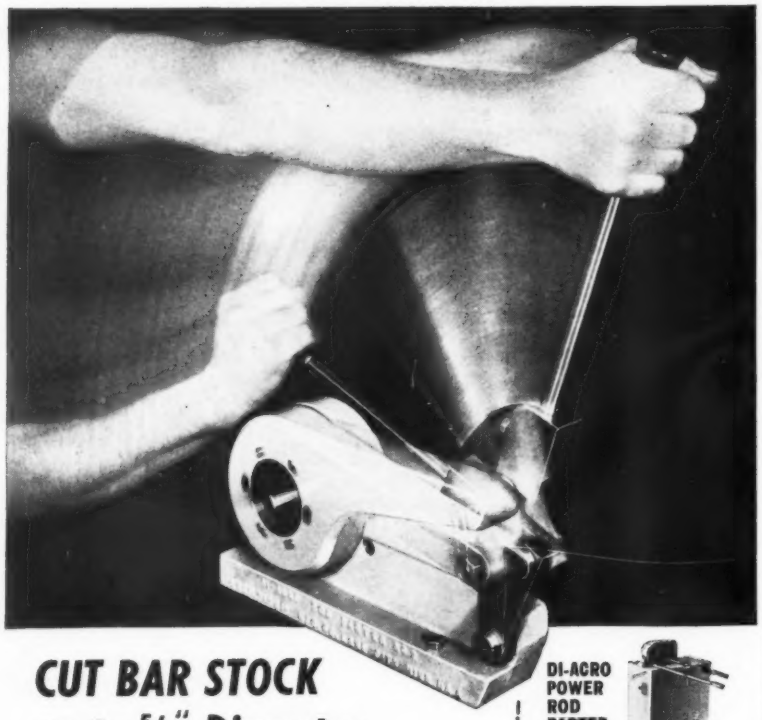

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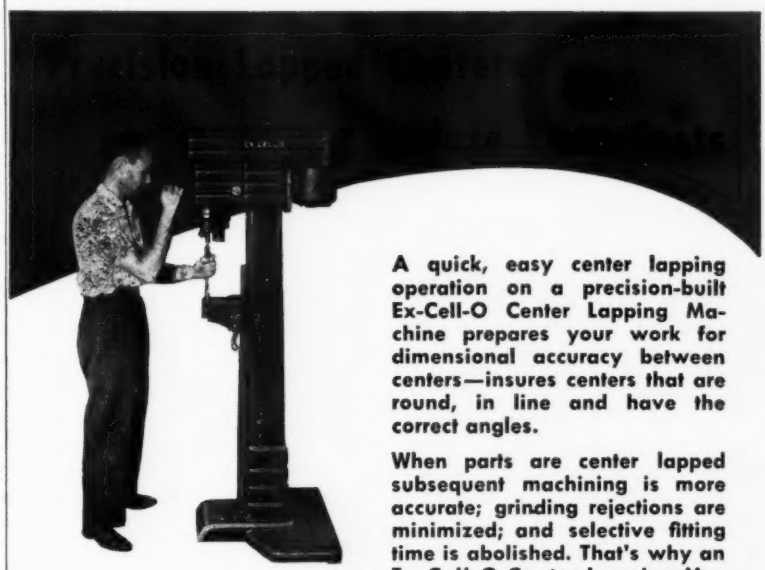

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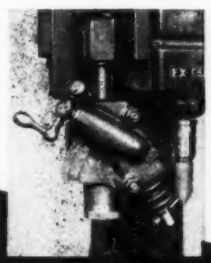

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7th ANNUAL CARBIDES FEATURE ISSUE

Looking Ahead in

MACHINING WITH CARBIDES

THIS YEAR once more finds the carbide tool industry at a crossroad. Which way should it direct its development activity in order to best serve industry? Straight ahead, or in a new and different direction? Should it continue to develop more new grades or turn to fewer grades? Should tools become simpler or more complex? Do brazed tools or insert types have the best potential? And, among insert types, should it be the "slug" type or the "no-grind" insert which you just throw away when used? What about ceramic cutting materials?

Regardless of all the developments in carbides that have taken place in recent years, we are far from the ultimate in tool materials . . . just as industry is far from the ultimate in machining practices. It is in recognition of this that we at Wesson have launched a major expansion of our only recently completed new research facilities.

We believe that these facilities will provide some of the answers. Others will come from research organizations of other carbide and tool producers. But, for the key to the answers we need to define the problems faced by the metalworking industry itself. These can be surmised by observing some current trends.

Let's look at some of them.

The more successful manufacturing enterprisers welcome change. While others nap, they evaluate new developments as to potential application to their operations. Which group are you in?

by W. B. Duncan
Chairman of the Board
WESSON COMPANY
Detroit, Michigan

Machining Speeds

As yet, there is no end in sight to the rapid rise in machining speeds that has characterized metalworking in recent years. Speeds and feeds are still going up. We went from 400 to 1,000 sfpm and then to 2,000. What is next is hard to predict.

Cutting speeds in excess of 7,000 sfpm have already been achieved successfully in the experimental machining of steels, and speeds above the 10,000 sfpm mark have been accepted for certain types of non-ferrous machining operations. Actually, speeds will be increased by the machine tool builder as rapidly as metallurgical progress will permit.

Undoubtedly, it would have been difficult for carbides to take present day machining speeds in their stride had it not been for the vast improvements in machine rigidity achieved by the machine builders. Machine tools have even less vibration at today's high cutting speeds than they had at the lower speeds of a few years ago. Without this achievement, carbide tool life would be so short that the higher speeds would have become highly impractical.

We had to improve our metals, and we had to improve our production methods. We had to improve quality control. And to keep pace, we had to improve tool design and tool application. We will have to maintain accelerated development from now on.

If the increase in machining speeds were to be accompanied by lower feeds and depths of cut, the problem would be greatly simplified.

But this is not the case. Industry is after a straight line boost in metal removal rates. Power, then, is going up in direct ratio to the speed. Therefore, tools that can take this big increase in cutting load with better performance constitute a primary objective.

Influence of Automation

More influential in forcing new developments in cutting tool materials is the accelerating trend toward automation. It is producing demands for overall increases in tool life, reduced tool changing and downtime, a balancing of tool life in successive operations, and tool dependability.

All too often, the performance of an entire line depends on one particular tool. Where this is true, no compromise should be made with tool or carbide quality for the sake of price. It is malpractice to drop production rates to ensure desired tool life, just because of inferior tooling.

The magnitude of this is readily apparent when reduced to simple arithmetic. When the efficiency of a 30-million dollar production line can be drastically impaired (as much as 30%) by the performance of a single cutting tool, the relative cost of the most effective tool or cutting material can rarely be considered too high.

It is significant to note that this fact has brought about a greater realization of the absolute necessity for procurement practices based on quality and efficiency of cutting tool operation rather than on their price. Consequently, the axiom "you only get what you pay for" is having a new vital influence over all industry procurement practices. This has been precipitated by numerous painful lessons in "automation economics."

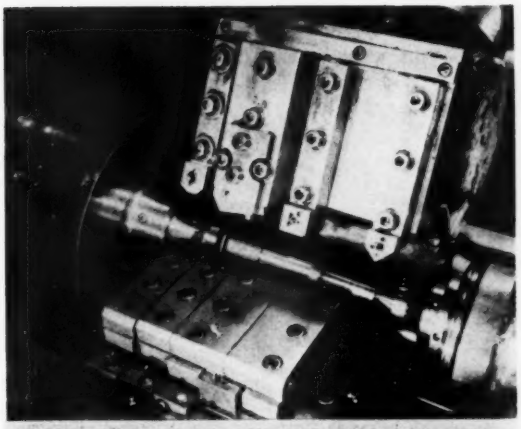


Fig. 1. Machining a stem pinion at 1135 sfpm on a carbide-tooled Fay Automatic. Even speeds like these will seem slow tomorrow.

In addition to bringing pressure on the carbide industry for better tools and cutting materials, automation is also bringing about the practice of changing tooling automatically. While much of it is still at the experimental level, rapid strides are being made toward completely automatic direction — electronic tool feeding devices that will compensate automatically for tool wear and automatically change tools when dull. They operate through an automatic "kickout", actuated when pressure on the tool increases to a certain point as it gets dull.

On the non-automatic side, there is a growing use of pre-ground and pre-mounted tools inventoried right at the machines where they can be inserted without trips to the tool crib and without set-up delays.

While such tool changing procedures or their equivalents are almost mandatory with automated lines, there is no reason why some of the practices should not be used on non-automated

Fig. 2. The advent of high automation is the starting point for a new industrial and tooling revolution. New cutting materials and new cutting techniques lie ahead.

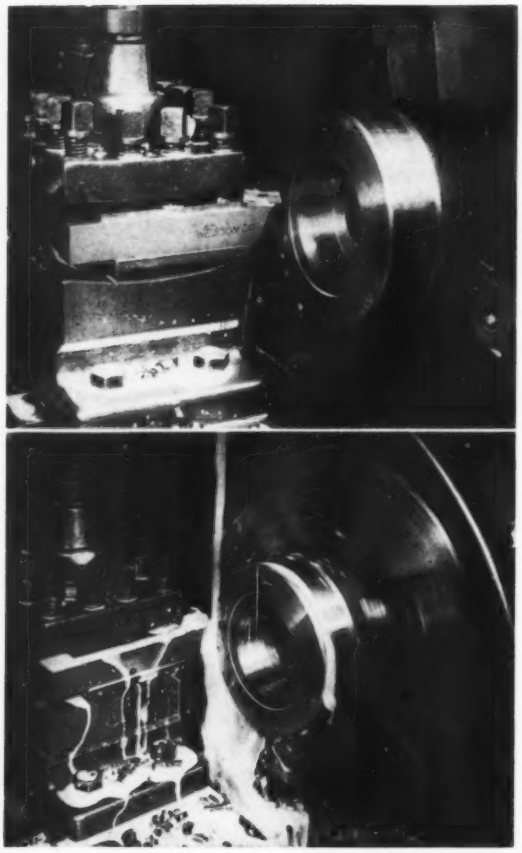


Fig. 3. No-grind inserts are making major headway in high production machining; they also help small shops use carbides without requiring skilled grinders and carbide grinding equipment.

lines. The time saving — both in machine-hours and man-hours—is worthwhile.

Non-Automated Shops

In plants where production runs are relatively short, automation of course does not offer much promise . . . at least not for the present. Nevertheless, some of the developments coming from the high-production lines definitely will produce changes in the smaller plants. In some ways the economic picture of the job-shop type of operation is already being improved.

Witness the use of no-grind inserts in short run plants. This tool type was actually developed first for high-production applications; but, it is enabling smaller shops to use carbides extensively without the necessity of acquiring tool grinding equipment or high cost labor to grind the tools.

Influence of Product Metallurgy

It used to be a truism that major developments from a metallurgical standpoint occurred primarily in war time and that developments fell to a far slower rate at other times. That concept is no longer true. There have been more metallurgical developments in product materials in the past five years than in the previous 15 and the rate of development shows no sign of slackening. Witness the frequency with which new types of stainless steels are appearing.

The recent transition made by the vacuum melting of titanium and zirconium to a practical-use basis will shortly bring about even more metallurgical departures.

All of these new types of metals will have to be tested and re-tested from a machining standpoint to identify the most suitable cutting materials, speeds and feeds. Nevertheless, these higher purity metals will be welcomed by the carbide industry.

In effect, it is recognized by the carbide industry that such developments MIGHT mean an eventual reduction in the number of grades required. Elimination of inclusions alone would broaden the range of product metals that could be handled by a single grade of carbide.

MORE New Grades or Less?

Carbide metals producers would welcome, of course, any opportunity to reduce the number of grades required. We have heard it said quite frequently that "there are too many grades of carbide." Present day requirements however make most of these grades absolutely essential.

New grades are introduced and will continue to be introduced for two purposes: (1) to meet specific new machining problems as they arise — problems which cannot be solved as well by existing grades, and (2) to reduce the total number of grades necessary. One of the most recent such developments was the creation of Wessonmetal "26", which is effective over a wide range of steel cutting operations.

The continuous stepping up of speeds has resulted in the addition of more and more grades to take care of the upper end of the steel machining range. To eliminate at least two or three grades, a broad-range carbide such as "26" was needed. That it also outperforms most of the previous narrower-range carbides was something not anticipated. It is not surprising, however. That has been the experience with many other new grades in the past.

Ceramics, cemented-oxide, and similar cutting materials are receiving much attention by the carbide producers and Industry in general, largely because of the accelerating trend to-

ward ultra high speeds. Although it may be quite a while before such materials are acceptable for general industrial use, it is probable that they will eventually occupy an important position in the manufacturing scene. It may be that further developments in machine tool design will have to come first.

No-Grind Inserts & Automation

The use of no-grind inserts has interesting potentials for automated lines. The ability to index these inserts with only a negligible lapse in productive time and the ability to replace them quickly without major set-up time represent economic assets well worth considering.

This does not mean that either brazed tools or slug-type inserts are on the way out. Each has its own particular field of application and economic advantages. Brazed single point tools will continue to dominate in the field of smaller shank sizes and for "low cost" tooling of short runs.

In general, it might be said that where you have a high proportion of different tool styles and sizes in ratio to output, brazed tools have inherent advantages.

Slug-type inserts also offer advantages over no-grind inserts. Chief advantage is the ability of the slug-type insert to take heavier feeds and speeds than is possible with no-grind types.

The longer life of slug types also offers cost advantages where the user has an efficient grinding setup. Not to take advantage of such a setup may be false economy. It is not expected that any clear cut answer for across the board application will be had for some time to come, and so the cost advantages of slug-type vs. no-grind inserts must be solved by the individual user.

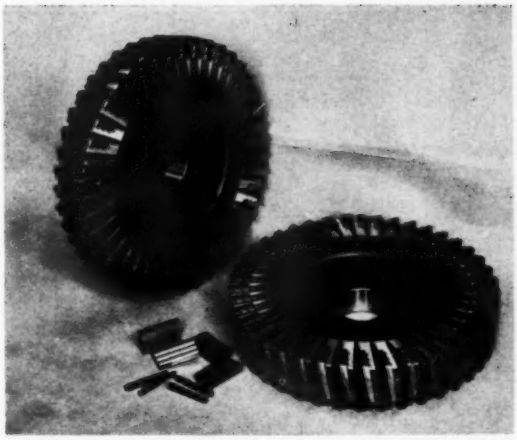


Fig. 4. New carbide milling cutters like these are now easily capable of 100 inches a minute and cutting speeds well above 1000 sfpm.

Incidentally, big advances are currently being made in the design and performance of grinding machines for slug-type inserts as well as for the grinding of brazed tools. With these, better grinding will be possible at lower cost.

Multiple Point Tooling

What has been said of machines for single point tools also holds true for machines using multiple point tools. For example, one of the new developments in industry is the wide use of direct-drive high speed spindles on milling

Fig. 5. Slug-type or on-end inserts have a definite and important place where heavy cuts and feeds give high chip loads. No-grind inserts cannot match them for such applications.

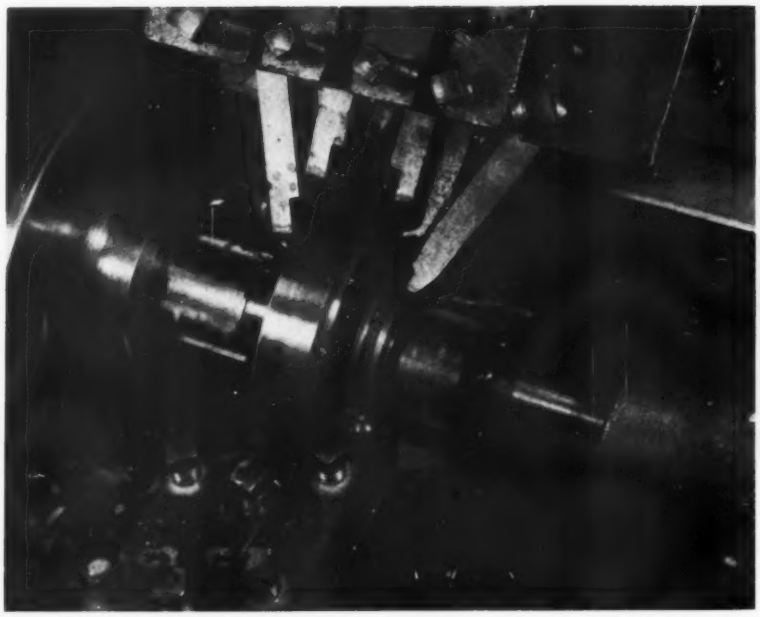


Fig. 6. Brazed single point tools still have a big future ahead of them. They are particularly suited to shorter runs where initial tool cost is important, also as form tools and for special shapes (frequently ground from low-cost standards).

machines. Coupling the motor shaft directly to the milling spindle eliminates reduction gearing, uses the motor rotor for flywheel effect and boosts the horsepower output of the cutting tool to a new ceiling.

In the field of boring operations, the use of no-grind inserts is making some interesting headway and, in some instances, they are giving slug-type inserts and more conventional boring tools a good run. The development is worth watching.

Flexible Standards Needed

Even aside from the influence of automation we are, of course, going through a major revolution in all of our high production practices. It may be starting with the extensive substitution of engineers and maintenance personnel for machine operators, but it is also bringing about a new concept of "standardization." Automation has come to imply the exact opposite of tool standardization as we have known it. Standardization under automation must become flexible to allow for all the inevitable changes. It is impossible to predict accurately all possible product developments and our standards for tools must be sufficiently flexible to allow for anticipated variations.

Making tool standards flexible instead of giving them absolute and fixed values is a new industrial concept and helps to illustrate the increasing complexity of our industrial picture.

To summarize, about all that can be predicted with certainty for the future is "CHANGE". We will have major changes in product materials; we are facing important changes in cutting materials; there are big changes ahead in the design of both products and tools. As a matter of fact, there are vital changes ahead in our whole approach to machining and production.

One thing we also can be sure of: Regardless of future developments in tool materials, carbides will keep pace. Tungsten base carbides certainly will continue to be with us in the future as far as we can see, just as high speed steel tools are still with us after 30 years of intensive carbide development.

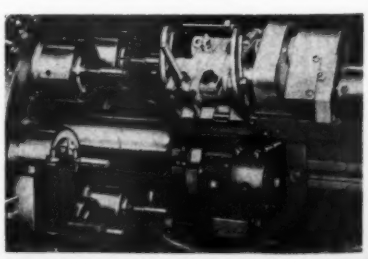
Slots and Grooves Milled on Screw Machines

The costly secondary milling operations required on some automatic screw machine products can now be eliminated by utilizing the Turnmill, an attachment designed for auxiliary multiple-spindle automatic screw machine operation.

This attachment, built by Turnmill, Inc., makes possible the milling of any number of flats or slots and also hexagon forms while the part is turning in the spindle. It operates during the normal cycle of the screw machine, and advances with the end tool slide, or can be accelerated.

The number of flats or slots to be cut is determined by the cutter design. Experience has shown that there is seldom any slowing down of the machine operation while the milling operations are being performed.

Turnmills are designed for every size and make of multiple spindle automatic screw machine in use today. They are set up fast and easily, and are adjustable to the full capacity of any automatic screw machine. Concentricity is assured to 0.0001" accuracy, because the cutters rotate around the stock.



Getting Maximum Economy from PREFORMED CARBIDE PARTS

by Alfred Stevens
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VALENITE METALS CORP.
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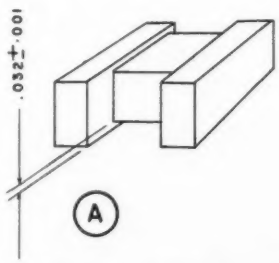
THERE WAS A TIME when machining with carbide tipped tools was generally limited to fairly simple forms, because of the relatively high cost of grinding intricate forms into this extremely hard tool material. Similarly, many die sections and machine or wear parts were costly to produce.

Removal of large amounts of hard carbide stock was expensive because of wheel wear and the laborious nature of the operation. Also, excessive stock removal rates tended to result either in cracking the carbide completely or in producing a fine crack network which caused early tool failure.

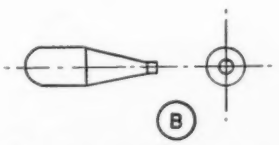
Carbides can quite easily be formed to shape in the soft stage prior to sintering. At one time, however, the use of this technique was limited by lack of know-how and the inadequacy of the equipment available.

Today new equipment, designed especially to preform carbide shapes, and advanced preforming techniques broaden the use of tungsten carbide and bring the machining economy of this material to many more operations.

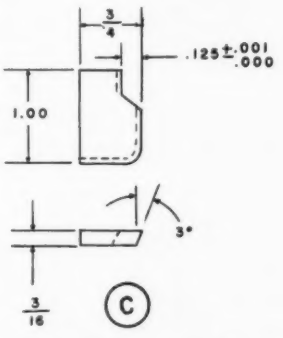
However, technicians in carbide plants serving industry with preformed carbides frequently see jobs where slight alterations in customers' specifications would offer considerable savings in cost and an improvement in the tool. A knowledge of the basic process involved in preforming, and an awareness of its limi-



For the preformed carbide machine part at "A", a slight change of design could have made a considerable reduction in cost. It is not possible to support this part without overhang during the sintering process. A graphite block had to be made so that the lower surface of the center section could come to rest on the block during sintering. Because of shrinkage, the undercut on the preform had to be nearly 0.040" and considerable distortion took place before the final stages of the operation when the surface at last came to rest on the support block.



The carbide punch at "B" was very difficult to sinter without distortion because of the tip at the end of the taper. If it had not been for this tip, the taper could have rested on a graphite block having the correct angle and the surfaces would have remained in relation during the entire shrinkage. However, the tip prevented this and a large amount of grinding was necessary after sintering.



"C" illustrates a simple preformed turning tool tip made in a lot of 10 pcs. A superfluous operation in preforming would have been necessary if the customer had insisted that the small relief angle be included. Since the entire form had to be ground afterward anyway, it was a simple matter to add the 3° relief at that time without removing a large amount of stock. If a large quantity had been ordered, say 100 pcs or more, it would probably have been profitable to add the angle during preforming. If the part were thicker, this would also have been true.

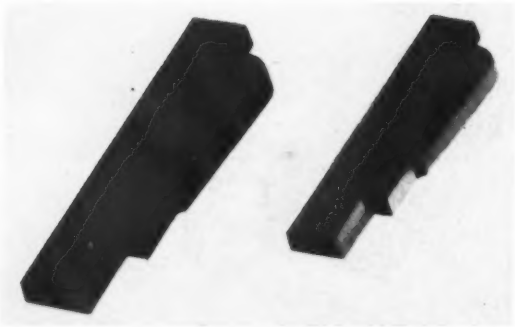


Fig. 1. A Valenite carbide preform for a form turning tool approximately 2" wide. At left is the part as prepared for sintering. The same part, sintered and ready for final grind, is at the right. In this particular case it was profitable to include the clearance angles on the preformed blank since it saved removing a large amount of stock from the hard carbide.

tations, would be of great help to tool designers, enabling them to take full advantage of the process and avoid its pitfalls.

Methods of processing carbide vary somewhat from plant to plant, but all carbides start

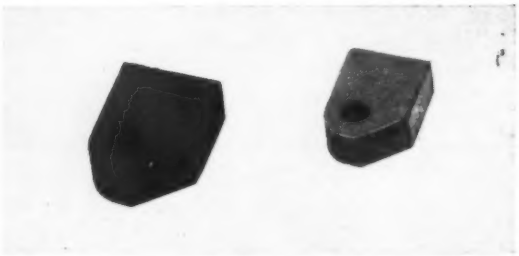


Fig. 2. A carbide wear part used in a machine. The hole was included in the blank prior to sintering. A job of this type is considered quite simple.

out in a fine, milled-powder state. At Valenite this powder is placed in an evacuated latex bag which is then immersed in water and subjected to enormous pressures—possibly the highest pressures in commercial use today. When the raw tungsten carbide emerges from this operation, the powder has been compressed into a dense billet which can be handled and machined into various shapes quite easily.

From this operation, called hydrostatic impacting, the billet is sliced into geometrically accurate shapes as raw stock to be machined into final forms. After machining, the carbide is placed in a vacuum furnace for sintering. It emerges from the furnace as extremely hard tungsten carbide in the state that is known to tool men.

An important thing to remember is that considerable shrinkage of the powder takes place in the sintering furnace. Thus final dimensions have to be precalculated and allowances made for shrinkages. A symmetrical piece is generally less subject to distortion than one that is not. Radical changes in cross-section may create problems, but seldom do they preclude preforming.

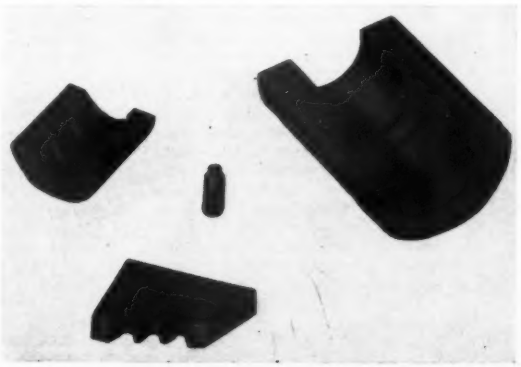
Regardless of the way the piece is placed in the furnace, shrinkage occurs equally in all three dimensions. While the piece is undergoing shrinkage at elevated temperatures, it is in a plastic condition. If the part is not to distort of its own weight, it must be oriented in a manner that will provide continuous support and prevent sagging and deformation of any portion.

The problem of supporting the piece during shrinkage should be considered by the designer when he plans a part that is to be preformed. Any unavoidable overhang should be supported. Sometimes it is necessary for the carbide technician to make small parts of graphite to help support the piece during sintering. This, of course, adds to the cost of the finished piece. In many cases it is far better to eliminate small changes in section so that the piece will have a continuous flat surface to rest on in the furnace.

The degree of plasticity during shrinkage varies with different grades of carbide. The higher the percentage of cobalt, the greater the plasticity. As a result, slightly more stock allowance for finishing must be made for high-cobalt grades in view of the possibility of distortion. The higher-cobalt grades begin at C-1 (maximum toughness) on the carbide industry

. . . *Continued on page 126*

Fig. 3. A group of preformed carbide parts. The large "U" shaped piece is about 2" long. The smaller "U" shaped piece contains an Acme thread form. The part in the foreground is a blade for a broach with an extremely complex form. The center piece illustrates the adaptability of preforming techniques to even very small parts. This part has a hole all the way through and considerable expense was saved by preforming it.



for production of large-diameter holes in non-rotatable workpieces

TREPANNING HEAD DESIGNS:

Chip and Oil Exits Make a Difference

by F. W. Lucht
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IN A PREVIOUS ARTICLE*, reference was made to trepanning with carbide in general, where the workpiece is rotated while the trepanning head is stationary and fed endwise only into the work. Two different trepanning head designs in common use were discussed, pointing out how existing machine tools were being modified to handle them — giving fantastic results when compared with previous methods of machining.

The majority of the holes trepanned today from the solid are within the 1¾" to 4½" range, using the trepanning head design identified as style A, Figure 1. With this design the cutting oil flows to the cut from around the periphery of the trepanning head, and leaves with the chips through the end of the head directly outside the core area. This design requires the use of an oil inductor in conjunction with the guide bushing.

When producing larger holes having, for example, an 8, 12 or 17" dia, it is more economical to use a design not requiring an oil inductor guide bushing unit, such as the one shown as style B, Figure 1. In this design, oil enters through the rear end of the drive tube and flows through the annular space between the drive tube and the core. It leaves the cut with the chips through the longitudinal flute in the periphery of the trepanning head.

*F. W. Lucht, "Trepanning with Carbides on Existing Machine Tools", p. 71, Feb. '55 Tooling & Production.

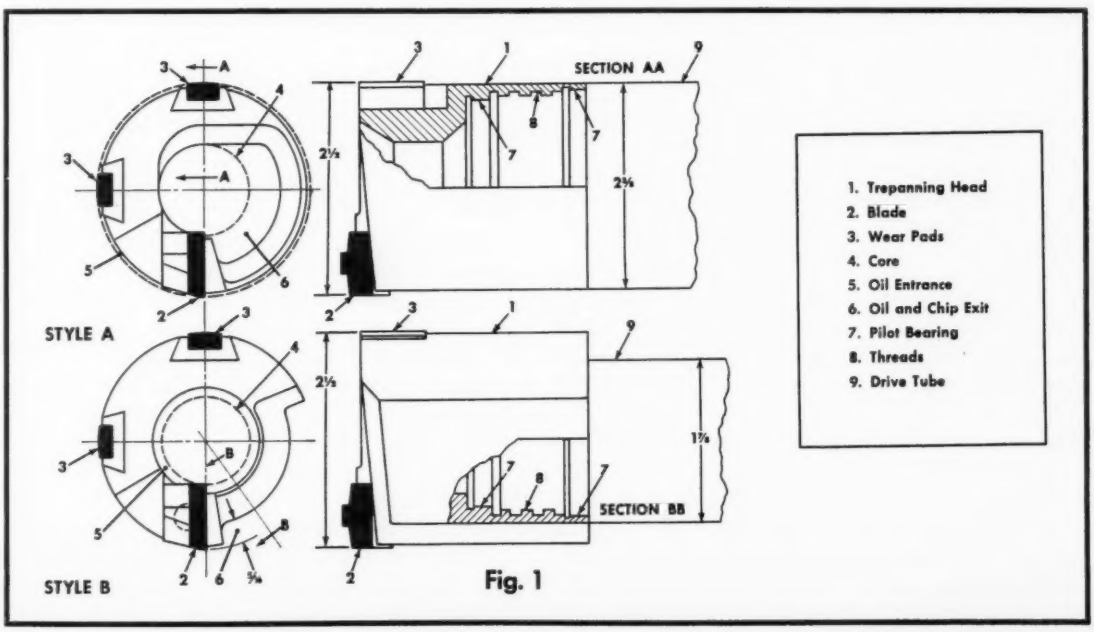

Fig. 1

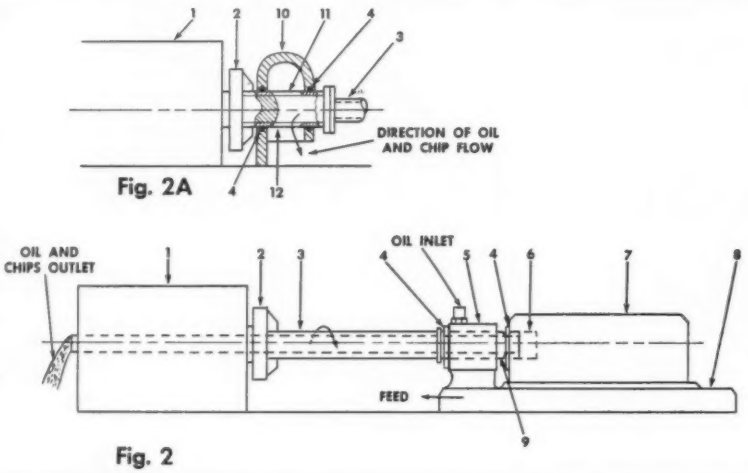

Fig. 2A

Fig. 2

Even though the second design is more economical to use, it has a minimum size limitation. For example, if this design were to be applied to a trepanning head as small as 2½" dia, the maximum diameter of the drive tube could not safely be larger than 1⅞" to permit free oil and chip exit through the annular space between the hole produced and the drive tube diameter. It can quickly be seen it would be advisable to use the style A trepanning head with its 2⅜" dia drive tube, giving a much more rigid setup than with the 1⅞" dia drive tube provided by the style B head. This added rigidity reduces the tendency to chatter while trepanning larger hole sizes, until the 4½" dia hole size is reached. This is why the style A trepanning head is recommended for holes 1¾" up to 4½" dia, and the style B head for holes 4½" dia and larger in size.

When it is necessary to produce 1¾" dia or larger holes, through work which is too irregular in outline to rotate safely at a sufficiently high rpm to obtain the necessary cutting speed in sfpm for the size hole required, it is advisable to hold the workpiece stationary while feeding it into a revolving style A trepanning head as shown in Figure 1.

Such an operation can be performed on either an engine or turret lathe, or on a horizontal boring, drilling or milling machine modified to hold the workpiece in a fixture mounted on the carriage, as shown in Figure 2. In this case the drive tube with its trepanning head is mounted in the lathe chuck. The guide bushing oil inductor unit, shown in more detail in Figure 3, is integral with the fixture supporting the workpiece, and is so located that its stationary guide bushing is always in full contact with a previously machined surface on the work face through which the trepanning head enters the workpiece. It is important that the guide bushing be always in full alignment with the machine spindle, and the direction of feed. The work surface contacting the guide bushing must be flat and square with the centerline of the spindle.

As indicated in Figure 3, the oil enters the guide bushing oil inductor unit, flowing through the annular space between the trepanning head and the hole. It picks up the chips as they form, and flushes them out through the space between the inside of the trepanning head and the core. The bronze packing gland and the oil seal at the rear of the guide bushing oil inductor unit serve to both reduce oil leakage and maintain a steady rest effect on the trepanning head while it is in operation. In case the bearing speed in the bronze packing gland is too high, it may be necessary to resort to the use of a set of ball or roller bearings.

If the headstock is not provided with a through hole, as in the case of a drill press or a horizontal boring, drilling and milling machine, or does not have a hole through it sufficiently large to permit the cutting fluid under pressure to dispose of the chips as rapidly as they are formed, an arrangement as outlined in Figure 2A can be used successfully.

The drive tube was made with three equally spaced, radially inclined elongated holes, adjacent to the chuck, for oil and chip exit. The splash from the oil and chips leaving the rotating drive tube was eliminated by the use of an oil-and-chip deflector with oil seals as indicated. Both the drive tube diameter and its wall thickness within the confines of the oil-and-chip deflector were increased to compensate for the tube cross-section lost in pro-

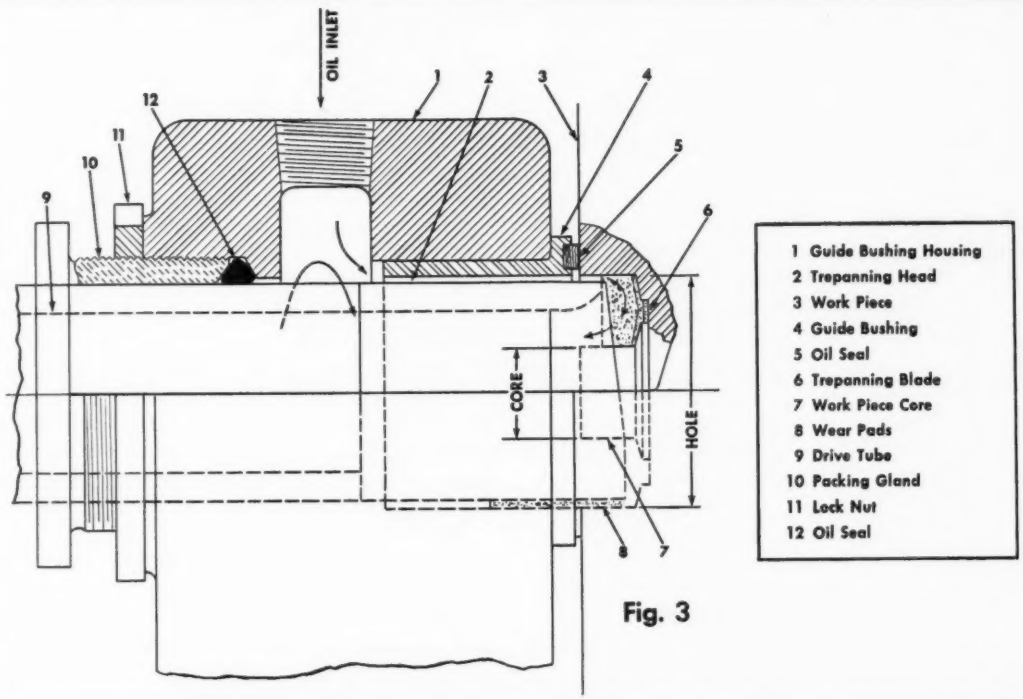

Fig. 3

viding for the necessary port holes. This not only gives the drive tube the necessary overall rigidity, eliminating chatter, but also provides much more freedom to the chip flow at the oil and chip exit point.

When it is necessary to produce large diameter holes (4½" dia or larger) in parts that are irregular in shape and too large to be revolved, it is advisable to mount them in a fixture up against a guide bushing on a lathe carriage as shown in Figure 4. The setup is similar to that previously referred to in Figure 2; only the oil inductor portion of the oil inductor guide bushing unit is omitted, making it a somewhat lower priced unit to fabricate. Thus it is necessary to use the style B trepanning head as shown in Figure 1.

If the oil cannot be applied through the headstock, an arrangement as outlined in Figure 4A can be used where the oil is piped to an inductor unit located close to the chuck and flows into the drive tube through port holes. This portion of the drive tube is made sufficiently larger than the regular drive tube to

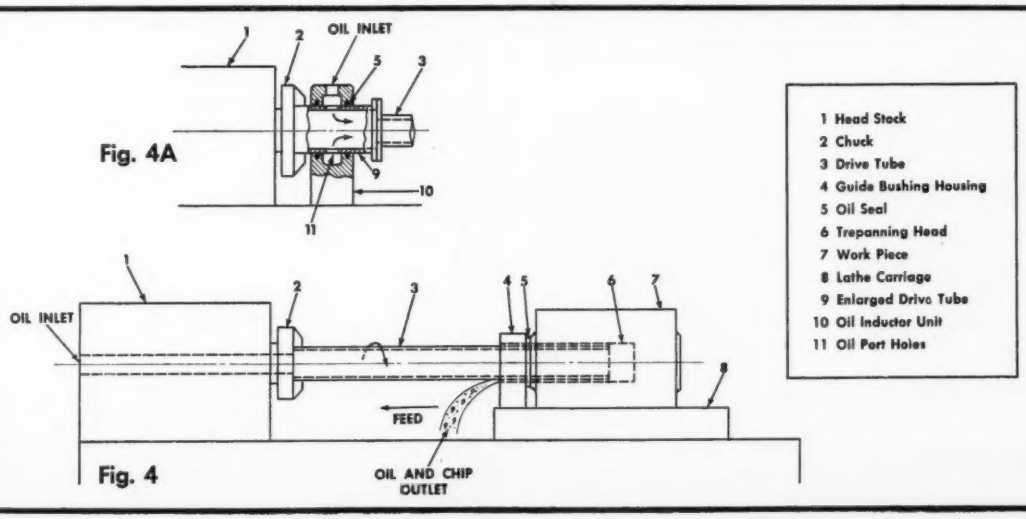

Fig. 4

compensate for the material removed in making the port holes, thus giving the necessary overall rigidity to the drive tube and eliminating chatter.

The oil under pressure flows through the drive tube into the annular space between the inside diameter of the drive tube and the outside diameter of the trepanned core as shown in Figure 5. Here the oil picks up the chips as they are formed at the cut and flushes them through the longitudinal opening or flute in the periphery of the style B trepanning head shown in Figure 1 (and illustrated in Fig. 5, Feb. 1955, Tooling & Production), and out in the open through the annular space between the trepanned hole and the outside diameter of the drive tube. In this case, it is advisable to make the distance the trepanning blade and the wear pads overhang the trepanning head body not greater than 0.015". This holds the oil leakage past the body to a minimum, thus forcing the maximum amount of oil through the chip flute to aid in chip ejection.

It is of utmost importance in a high speed trepanning setup in any plant to have all trepanning blades (¾" wide) and all the wear pads for a given size head be made interchangeable. Whenever possible, the same size blades and wear pads should be used for all other size heads, giving a complete overall interchangeability of blades and wear pads which can be considered as standard. The blades should be tipped with a grade of carbide which can operate within the 310 to 425 sfpm range and the 0.006 to 0.010" feed per revolution range. The grade of carbide should also have an optimum resistance to wear, thus retarding both the tendency to crater and the development of a rapid flank wear at the cutting edge. This is a decided aid in maintaining hole size to close limits even though a deep hole may be required.

The self-guiding action of a trepanning head in the hole which it is producing, combined with the torque effect from the drive tube, frequently develops a vibration period which has a detrimental effect on the wear pads. This necessitates the use of a tougher grade of carbide for the wear pads than that used for the blades — a grade of carbide like 370, which provides both toughness and very high resistance to wear. Some manufacturers of trepanning heads have adopted this method because it not only facilitates their tooling, but it also simplifies the stocking of perishable items by users of these heads.

The use of a high grade soluble oil cannot be too strongly emphasized for a trepanning

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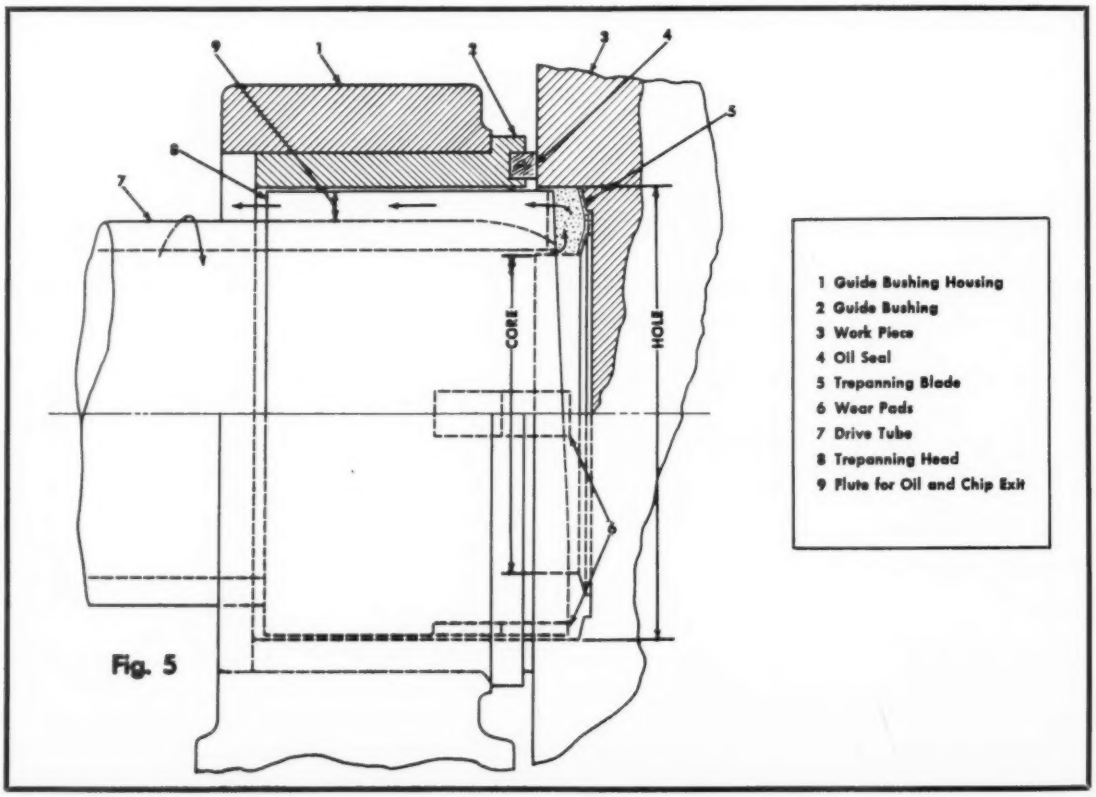

Fig. 5

Error Diagnosis in CARBIDE TROUBLE SHOOTING

by Antoni Niedzwiedzki
Field Service Engineer
FIRTH STERLING, INC.
Detroit, Michigan

"TROUBLE SHOOTING" is usually composed of an "error diagnosis" and of a following "cure" by application of all possible preventive steps. It is evident that such steps are not very difficult to determine when our error diagnosis is quite positive. The preventive steps might then be easily found in carbide manuals, technical text and handbooks, and in different technical reports.

Error Determination Chart

Our report is limited to the thorough explanation of the accompanying Error Determination Chart in belief that, when the diagnosis of fault is once made, its subsequent cure seems rather simple and consists in applying preventive steps broadly described in technical literature.

The troubles, listed across the top of the chart according to their gravity (tool breakage, cutting edge chipping, cracking of the carbide tip, built-up edge formation and too rapid tool wear), may be caused by different errors shown down the left boundary of the chart. These errors may be caused by an incorrect cutting tool (bad tool design, bad tool making or improper selection of carbide grade), or by incorrect operating (bad working conditions, bad use of coolant or bad tool setting).

The practical use of our Error Determination Chart is rather simple. We know what happened and are, therefore, easily able to relate our trouble to the correct trouble heading. We know more or less well the specific conditions evidenced by the trouble, as we have before the damaged or worn cutting tool, the removed chips and the machined part. Therefore, comparing the trouble data with the trouble description in the chart and in the following detailed text, we are able to arrive at the correct error diagnosis.

The errors, listed in the horizontal ranges of our charts, are divided into two families: errors consisting of an incorrect tool (three upper ranges), and errors consisting of incorrect operating (three lower ranges). The index numbers (in parentheses) at the intersection of any error on the horizontal range with a vertical column refer to the following detailed description. In this way, we do not need to peruse the whole of this report to find out the most probable cause of a blunder. We simply consult first our Error Determination Chart, and then go to the chart's detailed descriptions with the help of the index number.

We would like to stress here that very often possible trouble is due to more than one single error. Even so, we built our Error Determination Chart upon the rather unrealistic supposition that there is but one single error involved which is causing our trouble. Such a supposition is necessary in order to simplify and shorten our trouble shooting. We must, first of all, look not for all possible errors at once, but for the most important single one. After its elimination, we shall look for the next one and so on. Any other charting system would be much too complicated and too burdensome.

Tool Breakage and Tool Edge Chipping

Tool breakage occurs, usually, under a too high chip load, while tool edge chipping occurs under the shock of the developed chip against the non-cutting part of the tool edge.

Nevertheless, it can easily happen that the breakage of the cutting part of the tool edge

AUTHOR'S NOTE: The aim of this report consists mainly in serving as a guide in carbide trouble shooting. We approach our subject by a study of our Error Determination Chart, giving a survey of different machining troubles, as a function of tooling or of operating. Thus are discussed, consecutively, tool breakage, cutting edge chipping, carbide tip cracking, built-up edge formation with scuff marks on the machined surface, as well as a too rapid tool wear on the relief face (wear land), or on the rake face (wear center). The report serves as an error diagnosis only and a detailed prescription of all necessary preventive steps to be taken must be found elsewhere in technical literature. A. N.

ERROR DETERMINATION CHART

	A possible ERROR consists in:	Description of the possible machining troubles:					
		TOOL BREAKAGE	TOOL EDGE CHIPPING	CARBIDE TIP CRACKING	BUILT-UP EDGE	TOO RAPID TOOL WEAR: LAND	TOO RAPID TOOL WEAR: CRATER
INCORRECT CUTTING TOOL	BAD TOOL DESIGN	Tool and/or its edge too weak (1) Lead angle too big (2)			Too low or negative-acting side rake angle (12)	Too big nose radius or too big lead angle (15)	Too small or negative side rake angle or too pointed tool shape (21)
	BAD TOOL MAKING	Tool and/or its edge too weak (3) Lead angle too big and/or cutting edge too rough (4)		Bad brazing (e.g. lack of sandwich) or bad grinding (e.g. burnt in grinding)(9)			
	INCORRECT CARBIDE GRADE	Too hard and . . . too brittle carbide grade (5)			Too soft carbide grade (13)	Carbide grade: Too brittle (16)	Carbide grade: Too soft (22)
INCORRECT OPERATING	BAD WORKING CONDITIONS	Mechanical shock, due to chatter or to intermittent cut (too small depth of cut, or too fine feed), or due to a complicated chip (badly working chip breaker) (6)		Excessive working heat admitted (10)	Too low cutting speed and feed (14)	Too high cutting speed (17) Too fine feed (18)	Too coarse feed (23)
	BAD USE OF CUTTING FLUID	Nil	Interrupted flow of cutting fluid, sometimes caused by a badly working chip-breaker (11)		Nil	No film or too weak fatty film in deep drilling (19)	Cooling too slight due to too small fluid output or poor cooling ability (24)
	BAD TOOL SETTING	Too much tool overhang or too much play (7) Tool set too low (8)		Nil	Nil	Tool set too high (20)	

occurs simply under the shock of the workpiece against the tool by interrupted cut, or that a breakage or chipping is simply caused by chatter.

It is understandable that the tool breaks down or chips when it is too weak for the imposed working conditions.

Bad tool design may consist of either a weak cutting edge (1), or improper orientation of this edge, so that it is rubbing against the workpiece rather than cutting it. This can easily happen when the lead angle is very big (2) and, consequently, the angle comprised between the cutting edge and the axis of the turned workpiece is very small.

Bad tool making may, of course, result in a cutting edge being much weaker than it should be according to the tool design, because the tool, quite simply, does not conform to the drawing (3). It might also happen that the grinding work was done incorrectly (e. g. with a too rough grinding wheel) and the edge is like a saw with several teeth (4). No doubt such an error may result in tool breakage or in edge chipping, especially by taking of very fine feeds, when a part or section of the edge is cutting and another one is rubbing against the machined surface. This might occur when the values of the roughness amplitude of the edge are very close to the theoretical chip thickness.

The selection of a **too brittle carbide grade** can, of course, only decrease the mechanical strength of the cutting tool and render it too weak for the available application. (5)

The selection of **bad working conditions** (6) has, of course, a big influence. In the roughing of forged pieces with a hard skin, it is necessary to select a **sufficient depth of cut** in order to avoid an interrupted cut. The selection of a **too fine feed** might easily cause a chatter, especially in the working of thin and long parts and, consequently, result in a tool breakage. **A badly complicated chip,** due to the lack of a chip breaker or to the possibility that the available one does not work properly, can also produce shocks of chips against the tool edge and result in edge chipping.

Bad use of cutting fluid cannot directly result in the breakage or chipping of a cutting tool. However, chipping of the edge may be produced indirectly. An interrupted stream of cutting fluid easily produces a weakening of

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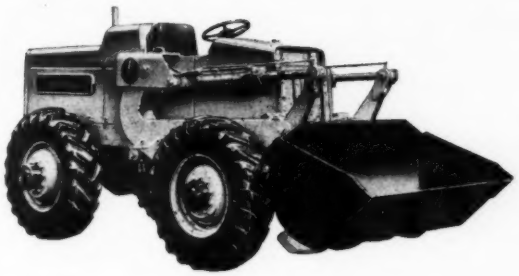


Employing some 700 people in the manufacture of the "Payloader" line of front loading industrial material handling trucks, The Frank G. Hough Company recently embarked on an extensive program of standardization. Here, the author outlines that phase of the program related to carbide tooling.

• *Production Benefits and*
• *Inventory Savings Are Realized . . . by*

STANDARDIZATION OF CARBIDE TOOLING

by Charles W. Johnson
Chief Industrial Engineer

and Elmer C. Cross
Tool Procurement Supervisor

THE FRANK G. HOUGH COMPANY
Libertyville, Illinois

IT IS AXIOMATIC that, in a successful standards program, the standards must be soundly based, carefully set, adequately maintained, and consistently administered.

This can only be accomplished if the method of doing each job is completely and carefully studied. It is necessary to clarify exactly **what** work is to be performed, **where** it is to be done, and **how** it is to be done. The tools and conditions must be such that results can consistently be duplicated each and every time the specific operation is performed.

It was in this area of activity, then, that we found an early need for a standardization of our carbide tooling.

Machining standards require not only standard methods and setups, they require a rigid control of tool design. One of our greatest problems had been that of each operator expecting a tool to be ground to his own "pet design," and no two operators doing the same operation used the same tool geometry.

Obviously, this condition had to be corrected. The simplest way to accomplish this would have been through a complete system of individual tool drawings; however, due to the time factor and a shortage of skilled help, this was next to impossible.

The approach we did take was to apply standard clamp-on type tools wherever possible, and to set up a system for assuring proper grinding of other type cutting tools. This system was flexible enough to provide for altering standard brazed shank tools on those operations where neither clamp-on nor standard brazed tools could be applied.

In selecting the group of manufacturers' standards to carry in inventory, we carefully examined our general usage and grouped all single point tools of a similar nature. By bringing together all those designs that had only minor variations and could probably be

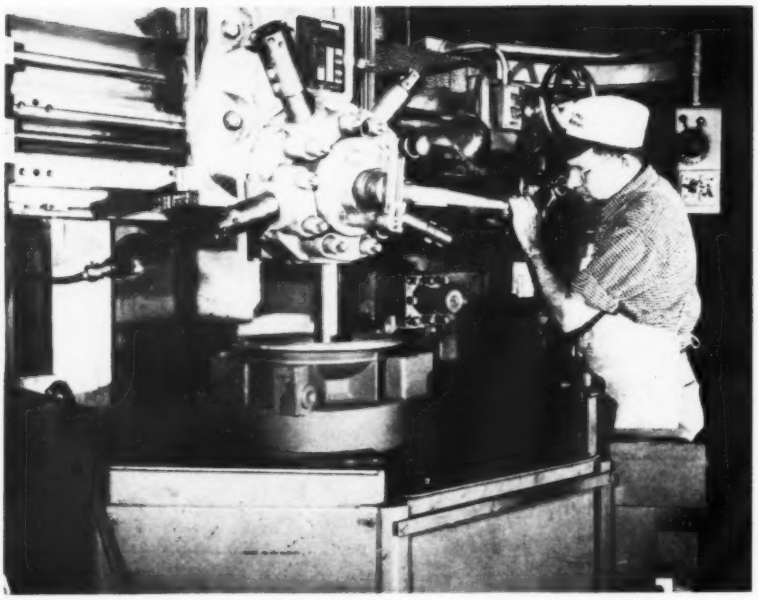
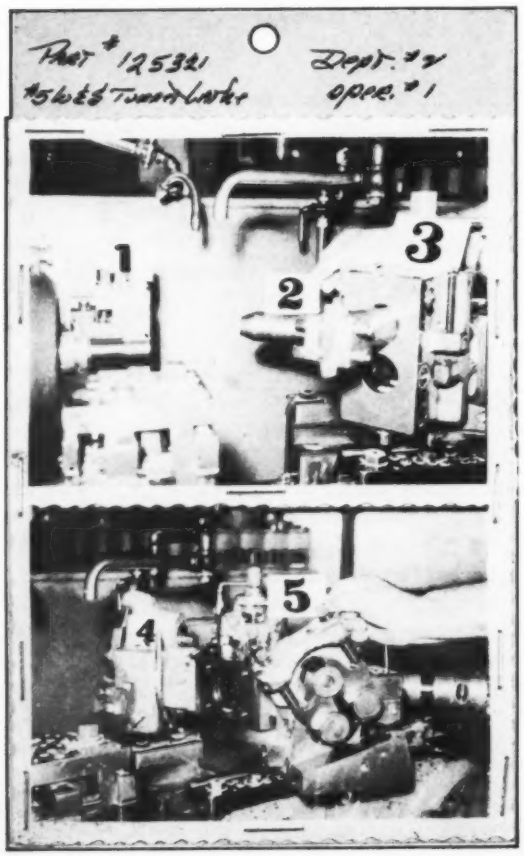


Fig. 1. Standard carbide tools play an important role in machining this complex work part on a 36" Bullard turret lathe. The following tools in this setup are catalog standards or modified standards:
Tool No. Function
TSE8-2A5—Rough bore
PT3-412-TSE8-2A5—Face
PB85-2A5—Rough turn and face
PT3-413-C8-2A5—Chamfer
PT3-414-TSE8-2A5—Finish bore and size, finish face
PT3-414-TSE8-2A5—Semi-finish face
PT3-411-FR85-2A5—Finish turn and size
PT3-413-C8-2A5—Chamfer
TSE-8-2A5—Finish bore and face
PT3-413-D16-2A68—Chamfer

PT3 prefix identifies the tool as a special single point lathe tool; then comes the specific tool drawing number; next is the designation for the standard tool from which this tool has been made.

adapted from a standard style tool, we were on the road to achieving a minimum inventory of single point carbide tools.

To save time, we requested a manufacturer of carbide tools in nearby Waukegan to supply a series of tracings. Each showed one specific style of standard single point tool, the geometry of the tool, and the C. I. S. (Carbide Industry Standard) identification.



Using these tracings, we are able to quickly produce a tool drawing for most of our non-standard single point tools. Many times this means merely adding a notation as to the variation from standard tool geometry. By adding the grade of carbide and shank size needed, the reference drawing is complete. The C. I. S. number is retained in the number assigned to the modified standard, so as to quickly show not only the exact tool number but also what basic tool it is made from.

A catalog for standard tools is being prepared by the Tool Crib. This was built up from tracings provided by the carbide tool manufacturer. Facing a picture of a standard style tool is tabulated data showing all of the shank sizes in which that style tool is available, with all critical dimensions provided for each shank size. Included on this catalog sheet is information as to whether we are currently carrying a particular shank size in inventory and in what carbide grades.

In setting up our standards, we have found it possible to standardize on three chipbreaker standards. We have found the following chipbreaker dimensions will handle our wide range of machining operations on steel.

Fig. 2. Polaroid-picture cards like this one are furnished by the Tool Crib each time a job is run. They facilitate setup and enable the operator to easily follow the prescribed procedure of operation.

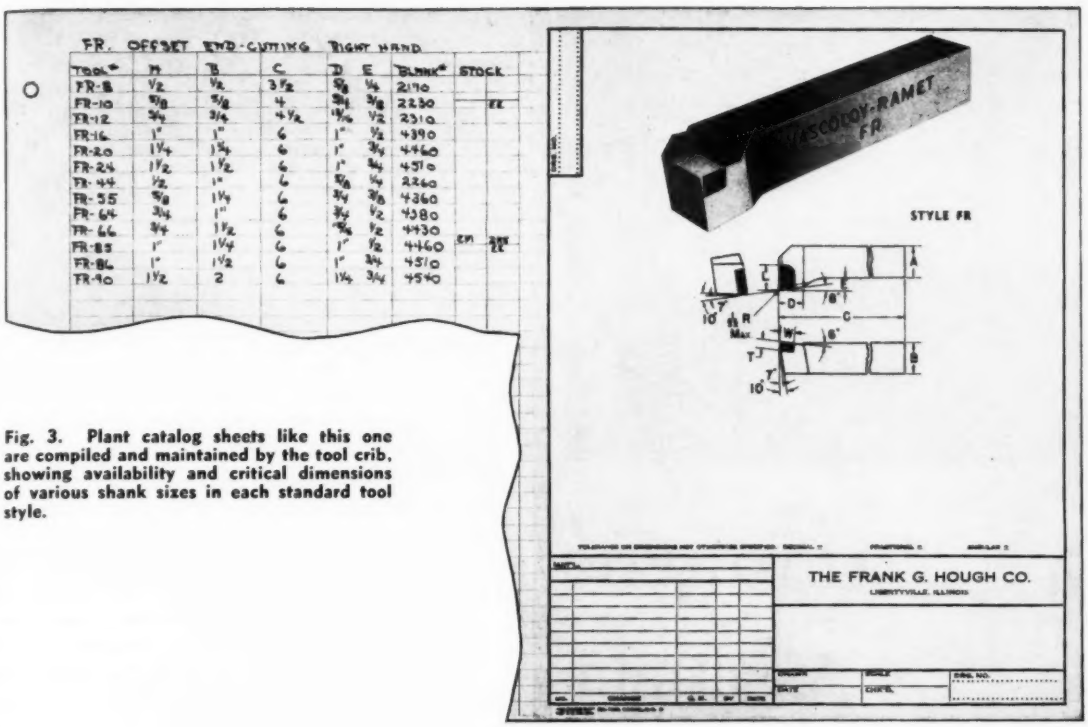


Fig. 3. Plant catalog sheets like this one are compiled and maintained by the tool crib, showing availability and critical dimensions of various shank sizes in each standard tool style.

Class

No. 1—1/16″ wide x .020″ deep
for 1/64-1/32″depth of cut x .008-.012 feed

No. 2—3/32″ wide x .020″ deep
for 1/16-1/4″ depth of cut x .008-.012 feed

No. 3—1/8″ wide x .020″ deep
for 5/16-1/2″ depth of cut x .008-.012 feed

In specifying a tool for the machining of steel, the engineer adds the appropriate chipbreaker class number (1, 2, or 3) to the end of the tool code number. Once a tool has been modified by the addition of a chipbreaker, the shank is stamped with the chipbreaker class number. No tool is changed without a corresponding drawing change.

This standardization program is of considerable help in selecting the tools to do a given operation. A method engineer, who works closely with departmental setup men, designates the machine to be used for each operation, the speeds and feeds, the cutting tools, the jigs and fixtures, and the sequence of elements in the operation. Tool design comes into the picture only when there is no standard tool to do the specific job effectively.

A time study engineer studies the job in detail, makes any advisable changes from the original specifications, and fills in a Time Study Observation Form. At this time, he also takes several photos, using a Polaroid Land Camera, as a permanent visual record of the setup.

After the time study has been accepted by the chief industrial engineer and the departmental foreman, no further change in tooling or method can be made without approval from the industrial engineering department. Each time the job is run photos of the setup and the Time Study Observation Form, less the detailed studied times, are given in plastic envelopes to the machine operator or setup man when tools are drawn from the tool crib. This procedure eliminates the frequent need for revising Process Form and Route Ticket.

We have found our tool numbering and catalog system to be highly effective in educating our tool crib attendants, grinding hands, and machine operators. Many hours of valuable engineering time are saved, and our stores and purchasing problems are greatly relieved. Since any standard tool is usable on many different jobs, tool obsolescence has been reduced.

With all tools being ground to specifications by skilled hands, tool spoilage attributed to grinding has been virtually eliminated. Longer tool life is being experienced, with a generally higher machine productivity the end result.

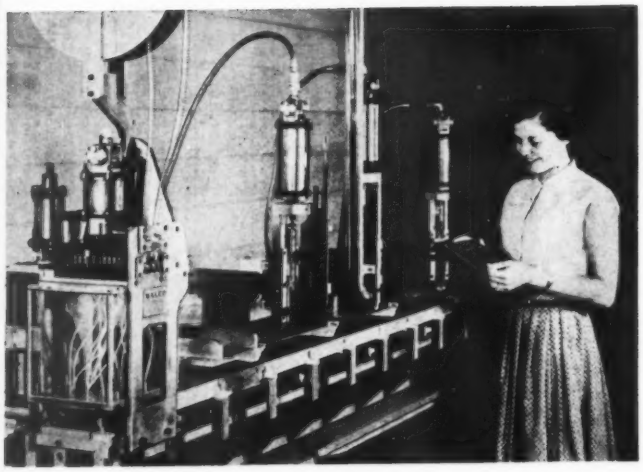


Fig. 1. Printed-circuit, pin-inserting production line. The machine in left foreground automatically inserts up to 40 or more self-retaining terminal pins and contacts within 3 seconds. Terminals in chain form are fed from two reels (partially shown at top left) through a cutoff and feeding mechanism and dropped through tubes into the printed circuit board.

AUTOMATIC ASSEMBLY OF PRINTED CIRCUITS

TO FURTHER MECHANIZE ASSEMBLY of printed circuits for radio and television, Admiral Corp. of Chicago, Ill., has acquired an automatic terminal insertion machine. This will supplement other automatic equipment already being used in Admiral's assembly lines.

The machine, manufactured by Malco Tool and Mfg. Co., also of Chicago, will insert up to 40 self-retaining terminals in any symmetrical or non-symmetrical pattern within a 3-sec cycle. Pins or contacts in chain form are fed simultaneously from two reels through a cutoff and feeding mechanism and dropped through tubes into the printed circuit board. A second stage of the machine presses the terminals into the board, thus engaging the self-retaining snap-in feature. The board is then ready for immediate further assembly and dip soldering.

This new step in assembly mechanization combines with other major advances recently announced by Admiral Corp. It is part of an extensive program inaugurated to simplify television assembly and improve quality control. Altogether, over 400 hand soldered connections, and the possibility of human error in each instance, have been eliminated.

Both consumer and worker will benefit from the program. Reduction of cost factors will be reflected in lower retail selling price of the finished product. Much of the monotonous and laborious work associated with various phases of unskilled manual assembly have been eliminated. In place of this, many highly skilled and technical job classifications have been created.

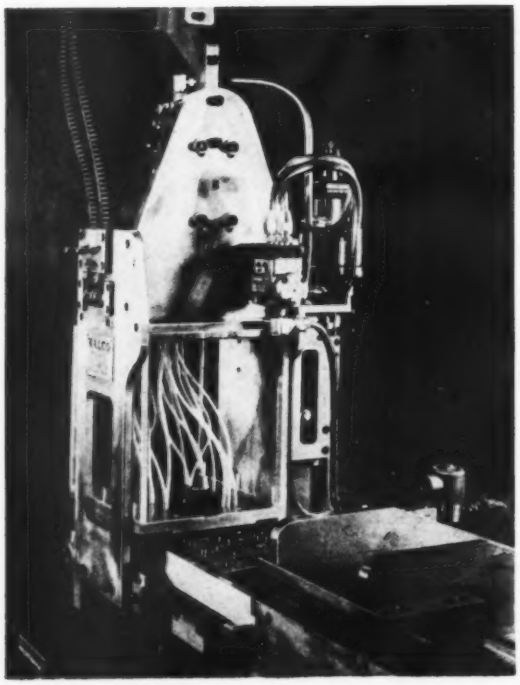


Fig. 2. At the second stage of the operation, a platen presses the inserted terminals into the board, engaging the self-retaining snap-in feature. Board is then ready for additional assembly and dip soldering.

EVALUATION OF CARBIDE CUTTING TOOLS

by John Gabrenas
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HAVE YOU EVER OBSERVED a carbide service engineer evaluate a tool that has failed in operation? Have you thought to yourself, "What is being checked? What possible conclusions can be derived from visual inspection?" These and other such queries are well-founded.

There have been, in the past few years, many differences of opinion as to the reasons for carbide tool failure. In an endeavor to realistically approach an answer, the basic rules in the machining of metals and application of tools cannot be ignored. We have all seen, at one time or another, the representative of a carbide manufacturer examine a cutting tool that has failed on the job. In most cases, this was done with an eye loop or pocket magnifier of from 3x to 10x magnification. Higher powered magnifiers become disadvantageous because they are hard to focus manually.

The carbide itself should be accepted as of high quality due to the rigid quality control being practiced in modern carbide plants of today. Therefore, it is safe to assume a mechanical failure of some nature has occurred during the operation of the tool.

To achieve the ultimate in performance for any given grade of carbide, the following factors must be present: proper speeds and feeds applied to a given material should show a "normal" type of failure; normal to the extent that the utmost in production has been achieved. Upon removing the tool, examination will show a consistent wear land on the cutting flat with a minimum of irregularities. Most variables in the wear land, identifiable by visual means, would be chipping or breaking down of the cutting edge.

Assuming the proper grade of carbide is being applied to the application, a new or reconditioned tool should be inspected. Does the tool have too sharp or keen an edge for the material being machined? Depending on the alloy, was the cutting edge properly prepared by honing? Is its ground finish suitable? All or any one of these factors can spell the difference between success or failure of a carbide cutting tool.

The diagnoses in the following paragraphs will apply mostly to the mechanically held type of solid carbide cutting tool. Types of failure to be discussed are: (1) excessive nose or point wear and (2) breakage to the extent of chipping or complete destruction.

Excessive Nose Wear

There are three primary conditions causing nose wear. They are:

1. Pressure is the predominant reason for this type of failure, causes of which can be determined from any of the following factors.

The case of mechanically held inserts, which are compounded in cutting position at a series of bi-negative angles for the purpose of providing cutting clearance, presents a handicap in many phases of operation. As the pressure of parting metal from the parent workpiece is always normal to the rake angles, it is quite apparent the nose of the tool will have the most forces directed to it. This type of failure

becomes more noticeable when heavy feeds are applied. With the increase in feed, more heat is generated in chip removal, causing certain grades of carbide not suited to this increase in operating temperature by reason of metallurgical analysis, grain size or amount of bond content, to be distorted under the severe pressure. This upsets the original geometry of the cutting tool. Dry machining, especially, requires the optimum in grade selection and tool geometry to keep this type of failure to a minimum.

2. Excessive speeds will also show a similar nose condition. Correction in this case would be the reducing of spindle speeds or the selection of a harder grade of carbide.

3. Many times in the initial contact of the tool with workpiece, minute chipping may occur. This open structure on the nose and cutting edge will, after a period of operation, appear as wear. Proper conditioning of the tool will correct this.

Premature nose wear in the brazed-on type of single point tool evidences similar characteristics of failure when means of chip control are incorporated into the design for safety of operation. Here, the force of deflecting the metal removed again causes much more pressure in the cutting operation. Relieving the nose of the tool with a secondary chip groove placed about 30° to 45° away from the normal at the same depth will be of great value. The reason is that the greatest amount of chip thrust is away from the nose of the tool.

Breakage of Inserts and Tools

Mechanical holders should be examined thoroughly at regular intervals. Some inserts breaking in operation can be readily traced to mechanical failures. This, of course, excludes the occurrence of accidents during machine tool operation. As a part of the general tool control program in any plant using carbide cutting tools, the possibility of the following check chart evaluations should be considered: (1) Inserts constantly breaking through or across the greatest mass of carbide indicates improper support. The cavity of the holder for the insert may have been deformed due to constant use or accident in operation. (2) Clamping devices not holding inserts securely, especially where depths of cuts vary or interrupted cutting is encountered.

Triangular tools having an included nose angle of 60° are extremely fragile at the point when heavy chip loads are applied. Breakage in this area is common if proper precautions are not taken. What can occur and what corrective measures are there to be taken to alleviate conditions of this nature? (1) Use the largest practical nose radii possible. This, in most cases, is governed by the specifications of the part design but in general purpose work, can be used to advantage. (2) Check for the thermal cracks in the carbide. These will appear along the cutting flank of the tool up to the depth of cut.

Some grades of carbide, especially those high in tantalum and titanium are very susceptible to thermal shock. Thermal cracks may be caused by poor coolant application where there is a sudden quench on the working surface of the tool. On planing applications, the air cooling between strokes has a similar effect.

In recent years, industry, constantly striving to increase production at lower costs, has accepted the throwaway type of mechanically held carbide tool. Expendable, or throwaway, types of inserts have the same problems in application. One further problem is apparent, however. Many times, tools are found to work very favorably when indexed around one side. Upon turning the inserts over, breakage is encountered due to the crater formed during the previous (top-side) use, giving poor support beneath the weakest portion of the tool — the point.

Anvils of the holder should have frequent inspection. Any damage whatsoever can account for an acute rise in tool costs. Materials used in anvils should also be investigated. In machining without coolant, heat dissipation, in which the anvil plays an important part, is dependent on the alloy used beneath the carbide. We have, today, anvils made of high speed steel, cast alloy and tungsten carbide. Some holders have none at all. All or any of these are suitable if applied properly under conditions for which they are intended.

Mark 25th With Gifts

The 25th anniversary plans of two Brooklyn business partners may have far-reaching benefits for American philanthropic organizations if their example is followed to any appreciable extent.

Instead of following commonplace practice by publishing a commemorative brochure or holding a party on the occasion, Bruno Schneider and Oscar Marquard, founders of the tool and die firm of Schneider & Marquard, Inc., Brooklyn, N. Y., estimated the cost of such a celebration and contributed, instead, $5,000 to the American Cancer Society and the American Heart Association.

How Cutting Rates can be Adjusted to Extend Tool Life

by B. Gisner, W. Ohlson, and G. Heden
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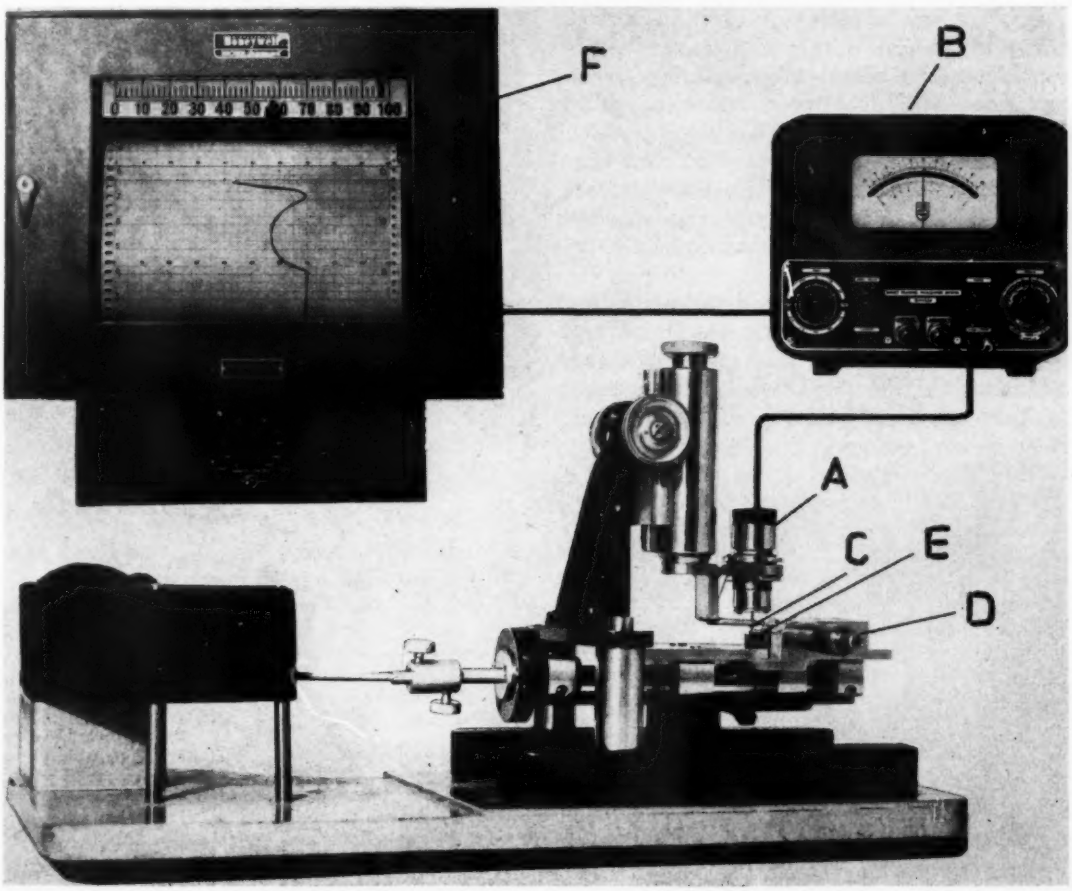
FOR A TURNING OPERATION one can choose either a high speed and a low feed or, the other way around, a low speed with high feed, and still arrive at the same chip removal. To make a general decision as to which combination gives the best result is next to impossible as many factors influence the result. One of the most important factors is, however, the tool wear. How this wear increases when turning with the two above combinations of machining factors has been studied in the Research Laboratory of the Sandvik Coromant factory near Stockholm, Sweden.

A large number of turning tests were made on bars of steel SAE 1086 of the following composition: C, 0.85%; Si, 0.25%; Mn, 0.35%; P, 0.026%; S, 0.010%; Cr, 0.06%. The hardness of the material was 250 Brinell. The same tests performed on other materials have shown that the results obtained are basically the same for all those kinds of steel giving normal flank and crater wear.

The carbide grades were Coromant F1 (C8), S1 (C7), S2 (C6), S4 (C5) and S6, the last mentioned grade being tougher than S4 and falling into a "C" grade lower than C5 in the steel cutting group.

When turning steel the tool becomes worn on the top side and on the relief side. On the top side a cavity develops at some distance from the cutting edge. When this cavity

Fig. 1. Apparatus for measuring crater depth: A, induction gage; B, measuring bridge; C, needle; D, measuring table; E, carbide blank; F, recorder.



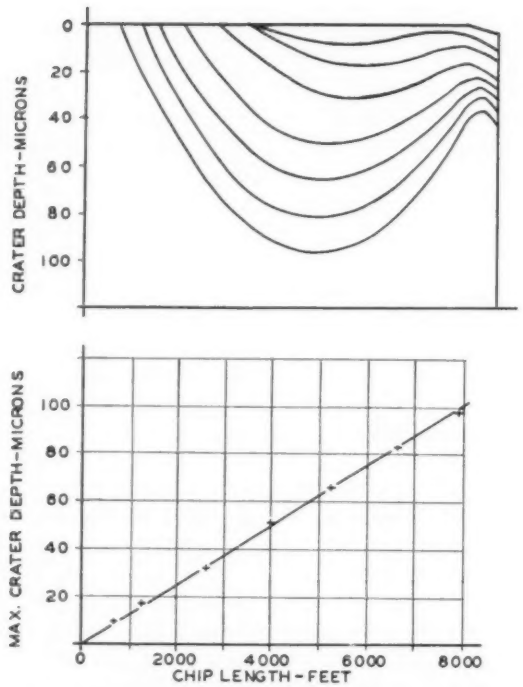


Fig. 2. Change of crater depth with increased chip length. Carbide, Coromant grade S4; feed 0.020 ipr; speed, 263 sfpm; depth of cut, 0.039"; nose radius, 0.039".

grows it becomes deeper and wider thereby approaching the cutting edge, making it weaken, and eventually the thinned-out cutting edge will break.

On the relief side a wear land develops which causes the cutting forces to increase. The wear land on the front and relief side also causes the diameter of the workpiece to increase as the tool wears off.

The depth of the crater on the top side is difficult to measure, but it has been found that the maximum depth of this crater is a good evaluation for this type of work. Crater depth has been measured in an apparatus schematically shown in Figure 1. The apparatus has an induction gage, A, and a balance bridge, B. The gage has a needle, C, and is mounted in a

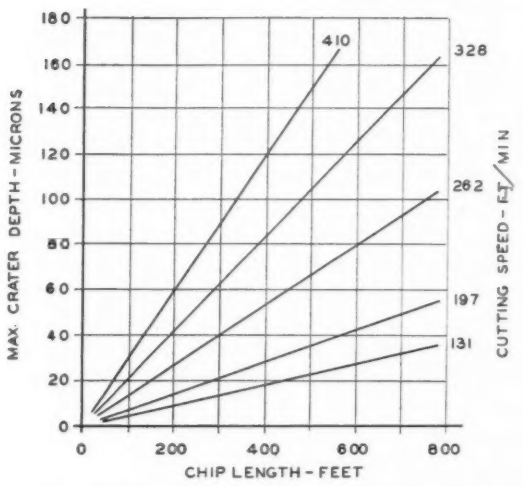


Fig. 3. Influence of cutting speed on maximum crater depth with change in chip length. Carbide, Coromant grade S4; feed, 0.020 ipr; depth of cut, 0.039"; nose radius, 0.039".

stand over a measuring table, D, that can move in two directions; the movements are controlled by micrometers. The position of the needle in the vertical plane is reproduced on a recording instrument, F, and thus one obtains a curve of the crater profile. The measuring is done across the deepest section of the crater, and at right angles to the cutting edge, E.

Figure 2 shows how the profile of the crater changes with increased metal removal. If the depth of crater is plotted against the chip length, a straight line is obtained. Thus the maximum crater wear can be projected by measuring the depth of the crater after any given chip length. The inclination of the line depends upon the wear properties of the tool material and on the cutting rates used. Figure 3 shows the influence of the cutting speed. The depth of the crater increases with higher speed at a constant length of chip. The curve of the crater depth as a function of the cutting speed, Figure 4, is rather straight at lower

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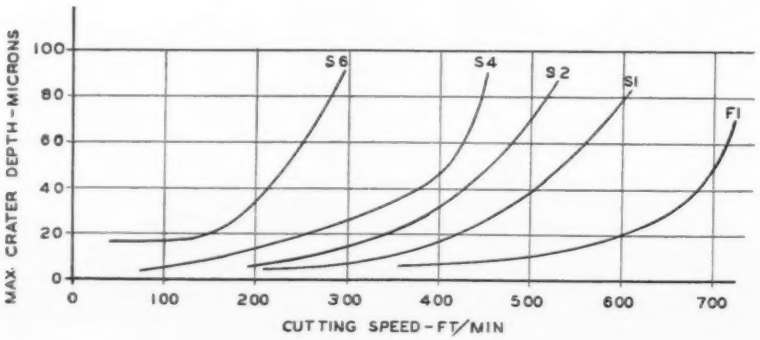

Fig. 4. Change of maximum crater depth with increase in cutting speed. Carbide, Coromant grades S6, S4, S2, S1, F1; feed 0.020 ipr; depth of cut, 0.039"; nose radius, 0.039"; chip length, 1640 ft.

A New Concept in Tool Servicing

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and

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THE RECENT DEVELOPMENT AND INTRODUCTION of an offhand electro-spark tool sharpener has caused industry to re-examine its requirements for servicing tools. Since the introduction of tools tipped with sintered carbide, much emphasis has been placed on the surface finish of the tool which has been serviced. Many approaches have been employed to produce surface finishes which demonstrate a very low micro-inch reading.

Tools which have been sharpened on an offhand electro-spark tool sharpener do not present the highly polished surface which in the past has been associated with good tool grinding practice. The surfaces, however, in practice oftentimes out-perform the semi-polished surface produced by abrasive grinding techniques.

Tungsten carbide in its various forms as used on single point tools or in inserts is normally sharpened by some type of abrasive grinding. Much thought and effort have been given to developing a satisfactory coolant that will lower the average temperature in the carbide while it is being ground. Any form of coolant, however, presents considerable difficulty in controlling the instantaneous temperatures produced in the area where metal removal is effected. Despite this, the value of the coolants in abrasive grinding is readily apparent since the proper use of such coolants allows metal to be removed at higher rates than can be accomplished in so-called dry grinding. The proper use of coolants is often the difference between a serviceable tool and one that has been cracked as a result of accumulated temperature in the carbide tip.

Carbide tipped tools are normally ground with either silicon carbide or industrial diamonds as the abrasive medium. In abrasive grinding the amount of material that is removed per unit of time is generally proportional to the hardness of the abrasive material and to the pressure that applies the tool to the abrasive wheel.

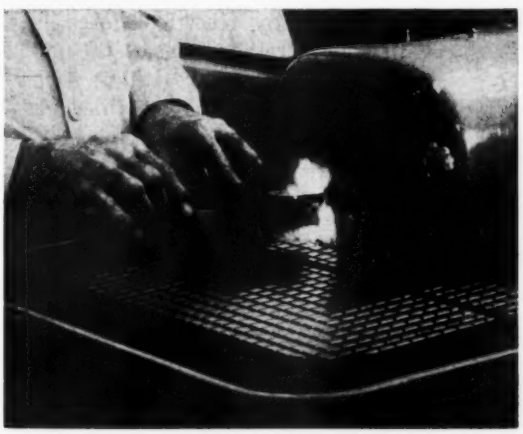
In offhand grinding operations this pressure is regulated by the operator. Considerable manual skill or feel is required before an operator can become proficient in the sharpening of tools by this method. While it is true that increased pressure removes more material per unit of time it is also true that wheel wear increases as the pressure is increased. The temperature of the carbide in the area where it is being ground also rises in proportion to the pressure applied, causing thermal stress likely to result in carbide cracking.

Varying the size of the abrasive particles will also vary the rate of metal removal and will in addition have an effect on the surface finish of the carbide being ground. If a very low micro-inch finish is required, it is necessary to use a very fine grit abrasive material. At the same time the operator must apply the tool to the abrasive wheel with very light pressure.

A single abrasive particle in any grinding wheel may be likened to a single point tool. This abrasive particle will produce a groove or valley in the work as it passes by the piece being ground. The depth of these grinding marks will be proportional to abrasive particle size and to the pressure utilized in the grinding operation.

With tungsten carbide being a notch sensitive material, it can easily be proved that a

Operator servicing a carbide tipped tool by the electro-spark process.



specimen which has been scratched on a surface will, when subjected to a normal bend test, fail because of a fracture which is initiated at the scratch.

Considering for a moment the effect of thermal shock on a carbide, one recognizes that it is possible to develop minute thermal cracks or checks during an abrasive grinding operation which may or may not appear visible to the naked eye. These thermal cracks or checks in addition to the normal grinding marks produce stress concentrations in the carbide which contribute to early failure under load. Again it is important to remember that formation of these thermal irregularities, the regularity and magnitude of their presence, is a function of tool to grinding wheel pressure and as a result their presence is controlled by the manual dexterity of the individual who is performing the grinding operation.

It is not necessary to dwell upon the importance of machine downtime to accommodate tool changes. It is obvious that a machine cannot produce during that period of time that tools are being changed. It becomes immediately evident that if a tool could be fabricated which would provide an increased operating line before servicing, considerable economies could be effected.

Case No. 1

Operation—Facing the hubs of railroad car wheels
Material—Badly scaled steel forging
Operating Conditions:
Speed—200 sfpm
Depth of Cut—3/8" to 5/8", variation due to uneven surface of the forging.
Feed—.032 ipr
Tool—Mechanically held carbide insert 1" square by 1/2" thick.
Performance—Inserts ground by conventional means failed consistently after 25 to 35 hubs being faced because of deep craters.
Inserts sharpened by the electro-spark process produced an average of 130 wheels per insert before being removed from service.

In the electro-machining technique which utilizes a sparkover-initiated discharge, many of the disadvantages resulting from abrasive grinding are eliminated. In this process metal removal is effected by electrical force field produced in concentrated areas of the material being machined, thus presenting a completely different physical picture than abrasive techniques.

Material removal from the workpiece is effected by current flow which emanates from the material being machined at a point source. The current distribution in the work follows the same pattern exhibited by iron filings placed on a sheet of paper positioned above a magnet. If the paper is tapped gently, the iron particles will align themselves in paths which exhibit the lines of magnetic force produced by the magnet. Examination of the pattern taken by the iron filings will reveal that the lines of force are quite concentrated at the poles of the magnet and become more widely separated as they extend from the poles.

It is important to notice that force is applied only to particles which are in areas of concentrated magnetic flux and that, as soon as the particles are removed from the area, or as soon as they orient themselves to the lines of force, the force is reduced on the particles. The same fact is apparent in the flow of electrical current in a sparkover-initiated discharge. The current flow in the workpiece meets with the resistivity of the material and generates an electrical force field, which attempts to remove the particle from its parent structure. In those areas where the current is of sufficient concentration or density to produce a force that exceeds the tensile strength of the material being machined, removal of material is effected.

It is possible by electrical techniques to control the amount of electrical current that is released in an individual discharge. This means that it is possible to control electrically the amount of energy that is employed in removing material in a grinding operation which utilizes the electro-spark technique.

We mentioned earlier that this type of machining utilizes the sparkover-initiated discharge. This statement means that the discharge current is started as a result of a voltage gradient between two electrodes, in this case the tool and the sharpening wheel, rather than as a result of contact between the two electrodes. This one fact contributes to a very important advantage in electro-spark grinding. In order to effect the desired separation between the tool and grinding electrode, a semi-solid dielectric is utilized as a spacer. This dielectric has a peculiar property of being an insulator until the voltage across it has reached a given magnitude, at which time it will rupture and become a very excellent conductor. Conveniently, this dielectric may be chosen to provide a spacing of less than a thousandth of an inch, utilizing the same technique employed to lubricate bearing surfaces.

In electro-spark grinders of this sort, when the tool is pressed against the wheel firmly enough to puncture the dielectric film, machining actually stops. This means that the operator cannot exceed the rate of metal removal which has been predetermined and built into the grinder's electrical circuit. In addition it means that it is not necessary for the operator to press the tool firmly against the wheel, and

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PART II . . .

MACHINING WORK-HARDENED ALLOY STEELS

by W. M. Halliday
Southport, England

CORRECTIVE MEASURES WITH WORK-HARDENED PARTS

When intelligently planned and properly organized, preventive measures mentioned in Part I are relatively easy to apply. The greatest difficulties will arise, however, in overcoming any work-hardening which occurs in the course of the machining operations. It therefore remains to describe and illustrate the various efficient and economical means whereby such correction can be accomplished in the quickest and simplest manner to enable the affected parts to be completely machined.

Undoubtedly the most effective way work-hardened parts may be rendered capable of further machining is by annealing. Unfortunately, this treatment is seldom practical for a variety of important reasons.

First, it entails removal of the workpiece or a length of bar stock from the machine, with consequent interruption and delay in production.

Second, with many types of components which have previously been shaped to an unusual outline contour, such removal from the machine chuck or gripping fixture may incur considerable trouble and some inaccuracy when replacing the parts after softening.

Third, the softening temperatures of stainless or alloy steels are generally very high, thus there is always much risk of the parts being severely distorted or permanently warped. These risks will be especially prevalent with parts of a delicate character, slender proportions, or having thin and relatively unsupported side-walls.

Fourth, annealing is essentially a process which must be applied generally over a whole workpiece, and therefore it will often be extremely difficult to secure the softening of some highly localized spot on the component. Most work-hardening effects are of this latter localized nature due to rubbing and overheating at only such spots.

Fifth, as a result of attempting to obtain localized softening, parts which normally are of substantial proportions and comparatively rigid, may suffer distortion. Thus, certain other vital pre-machined and completed dimensions may suffer serious loss of accuracy due to heating.

In cases where a generalized heating of the workpiece is precluded for any of the above reasons, localized heating may be obtained by means of the ordinary oxyacetylene blow torch. This is often a feasible solution, but it deserves to be stressed that the greatest care must be taken to avoid overheating the part.

Excessive heat may cause an undesirable change to occur in the micro-structure of the stainless or alloy steel, which will result in reduced corrosion resistance and other troubles when the part is placed in service. It is not advisable, therefore, to apply any torch heating to soften work-hardened surfaces without first obtaining expert guidance as to the safe maximum temperature for the particular grade of alloy steel. This does not apply to general annealing procedures carried out by means of a muffle furnace where the temperature can be accurately controlled.

Grinding

One of the most obvious and often most practical methods of dealing with material work-hardened on some local surface is to remove the hardened skin by grinding, if dimensional considerations allow stock removal.

A soft-grit grinding wheel should be employed for this purpose. It has less tendency to rub and glaze the treated surface, since there is less risk of the wheel becoming loaded with particles of hard material. Soft wheels retain their clean-cutting properties longer than hard wheels, and also generate less heat on the work. During grinding a copious supply of suitable coolant should be used.

In general run of work-hardened components produced on automatic lathes, it will be found that the removal of as little as 0.010″ will be sufficient to eliminate the hard spot so that the cutting tools can resume their normal cutting.

There are, of course, numerous instances where such grinding is not practical owing to the inaccessibility of the work-hardened spot or where the finished dimensions of other portions of the part forbid extra stock removal.

These difficult cases may sometimes be resolved by the application of small hand grinders having a flexible drive, operated by electric or pneumatic power. Tiny grinding burrs and stones of very small diameter can be gotten into a deep hole or recess, and thus can conveniently deal with hard surfaces in most restricted locations. Furthermore, one great practical advantage of the use of such versatile grinders is that the work need not be removed from the machine.

Cutting Tool Correction Methods

Aside from annealing or grinding away work-hardened patches, it is surprising the number of seemingly difficult machining problems arising from work-hardening which can be successfully solved by making relatively simple and inexpensive alterations to the ordinary cutting tools. This is particularly so with automatic lathe work.

In adapting a cutting tool for such purpose, it should be ground to an end cutting edge angle of approximately 12°, taking care to leave a narrow straight land about 1/64" wide up to the actual cutting edge. This land should lie parallel to the axis of the work. The tool should also be given a front clearance angle of 5° and a substantial side rake ranging from 8° to 10°. The meeting clearance surfaces should be so finely finished as to provide as sharp edges and fine a point as possible.

A tool of this modified character is illustrated in Figure 1. It is better adapted to burrow beneath the work-hardened surface because much less resistance will be offered to its penetration, due to the more acute angles and pointed cutting tip. It is also essential that the tool shank be of particularly strong and rigid section and of short length so that overhang beyond the front of the tool holder is avoided.

When a work-hardened area is encountered during machining with the conventional round-nose cutting tool of standard form and rakes, this should be immediately replaced by the burrowing tool just described. The cut taken should be started from the outside and the tool fed inwards under manual feed. The work should be rotated at a very much slower speed than normal. The chiseling action of this special tool will, in most instances, easily penetrate and remove the hardened spot at a single pass.

One frequent source of work-hardening is the common parting-off operation. Here, the tool is necessarily slender, and usually projects considerably beyond the tool-post, and thereby is subjected to much flexing and vibration. A special parting tool should not have any top rake, while the front clearance angle should be not more than 3°; just sufficient, in fact, to sever the part without leaving a pip. The shank should be particularly robust to avoid sideways deflection when the tool is cutting.

Much can be accomplished to avoid or reduce work-hardening tendencies in automatic machine work by designing the cross slide and turret slide cams to give fine feeds, i.e., only about half the feed rate employed when machining the ordinary free-cutting steels. In laying-out such cams it will be extremely help-

. . . Continued on page 138

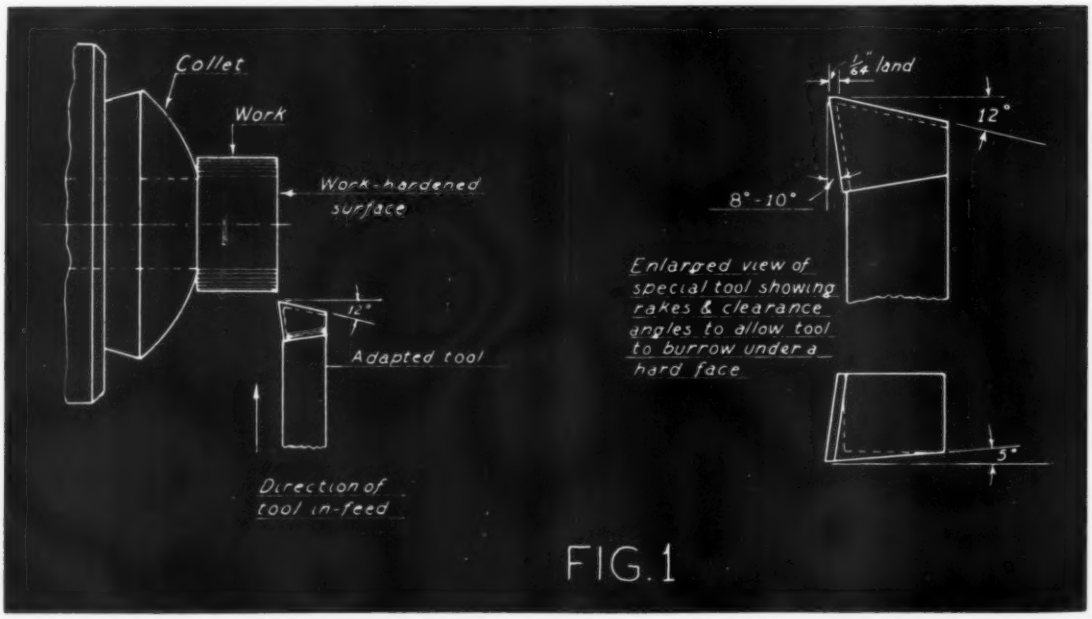


FIG. 1

The Big News

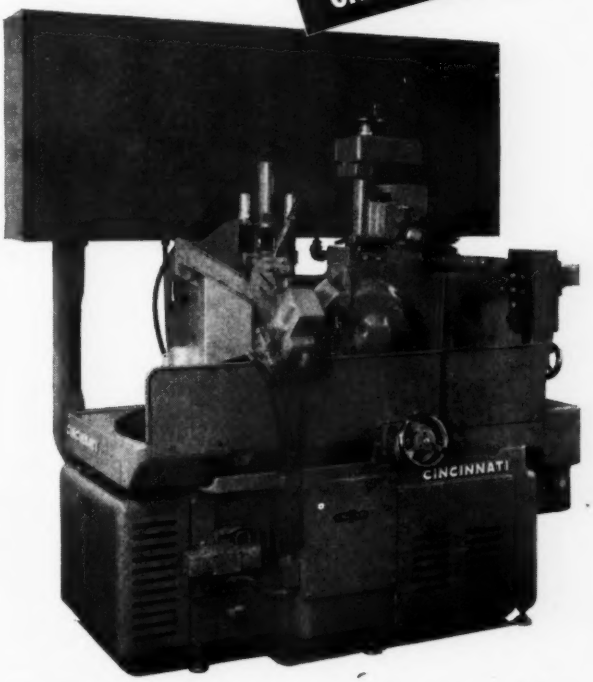
in High Production Precision . . .

NEW Micro-Centric Grinders

FILMATIC

Keeping costs down implies keeping up to date on all types of equipment. That's why the completely new CINCINNATI Micro-Centric is news of the first order. These new machines offer additional cost-reducing possibilities in grinding precise diameters on big volume jobs to the most exacting tolerances of roundness and squareness with one side. Here are five of the many new Micro-Centric points of interest:

CINCINNATI FILMATIC Micro-Centric Grinding Machine



NEW feed mechanism assures a higher degree of repetitive sizing.

NEW drive plate. Essentially an electrically energized magnetic chuck, automatically operated from the machine cycle. Simplifies and speeds up loading.

NEW overhead electrical control panel, integrated with machine; everything completely accessible.

NEW front handwheel control for headstock slide positioning. Two speeds . . . rapid for setup; slow for sizing adjustment.

NEW and more flexible automatic loading fixture; fewer wearing parts.

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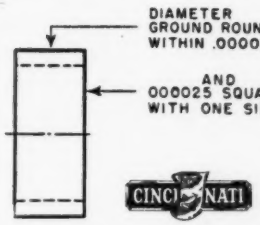
This is Micro-Centric Grinding



CINCINNATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

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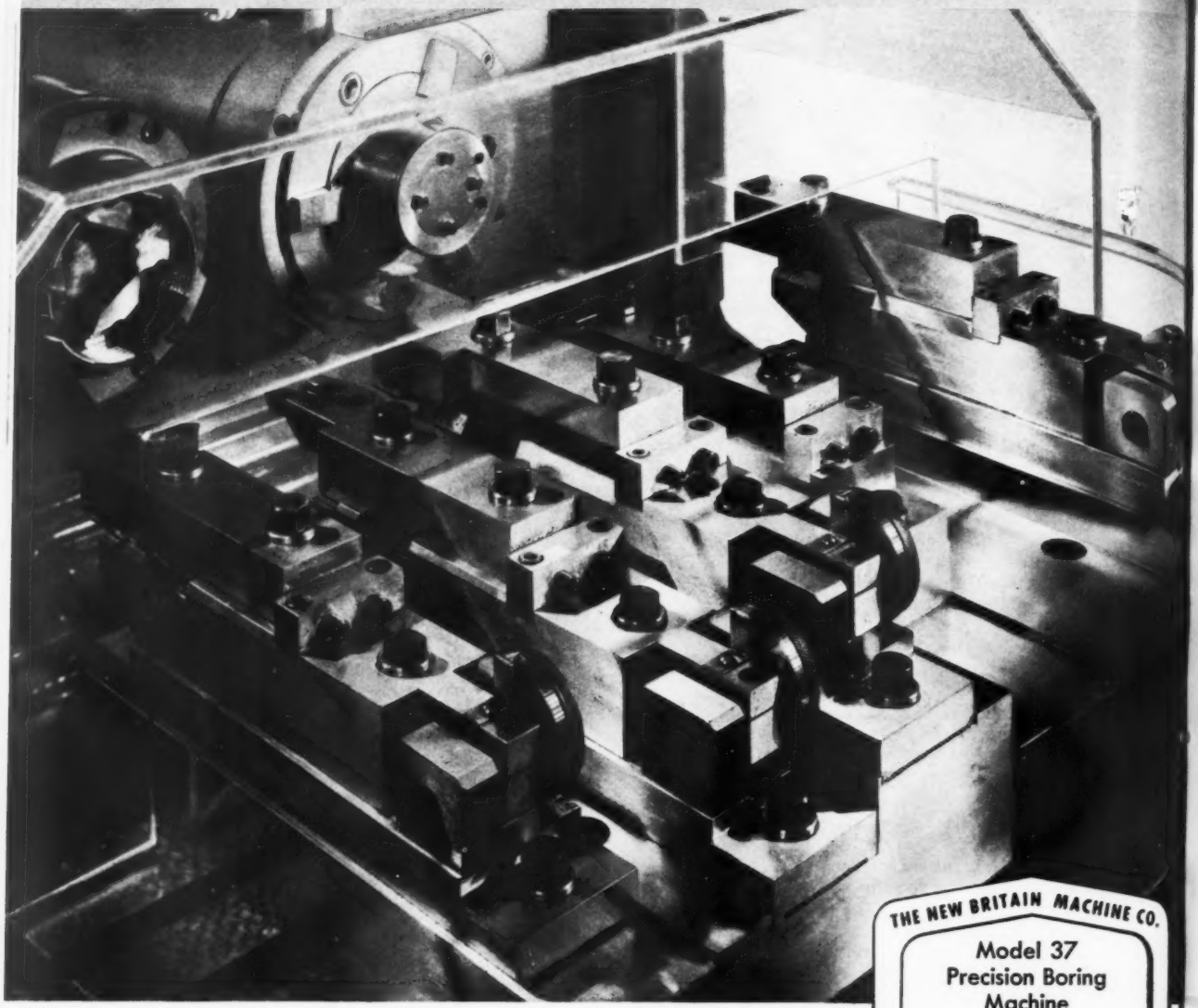

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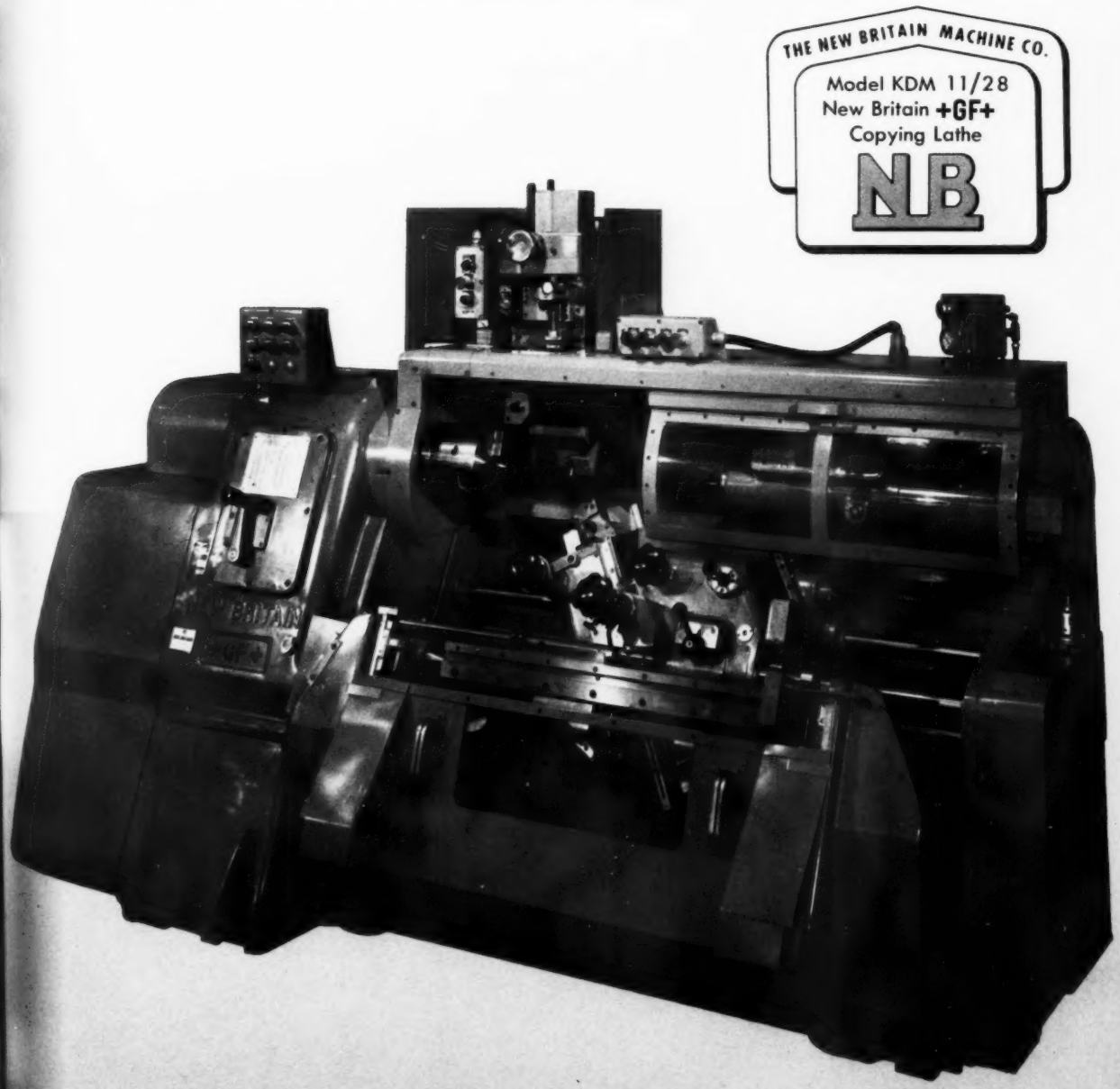
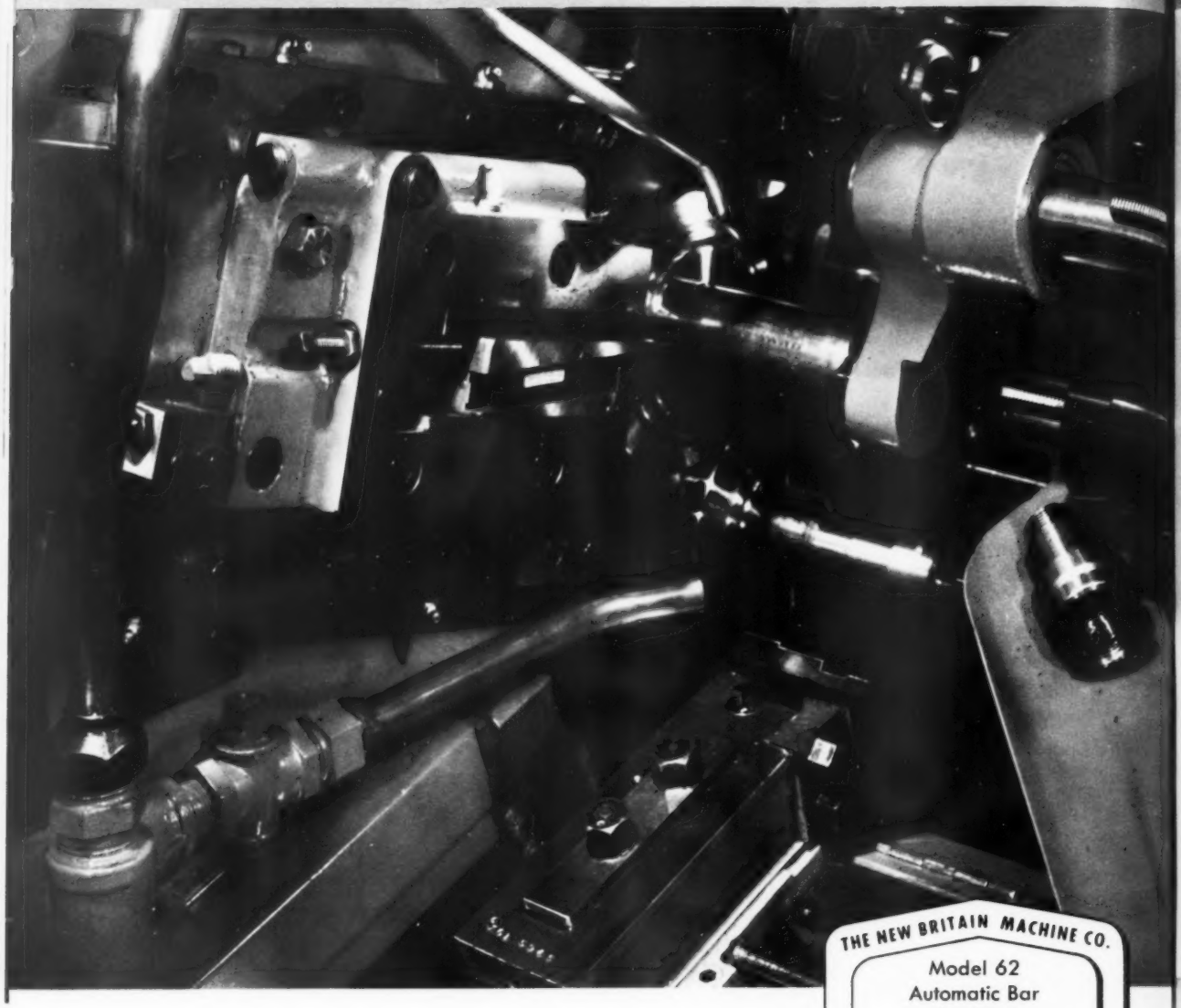
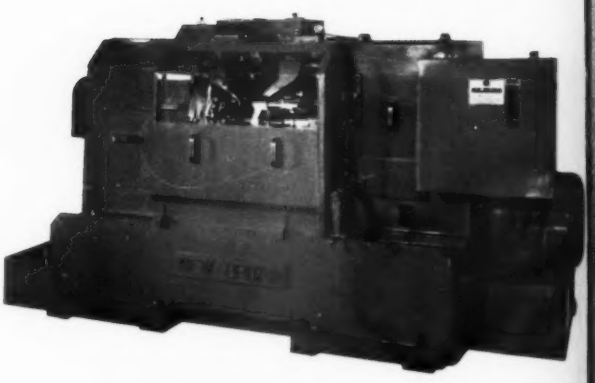




a rugged cross slide in every position

New Britain Models 60 and 61 Automatic Bar Machines are everywhere you turn. The new Model 62 represents new progress in rugged construction and versatility of setup. Your New Britain Representative can show you how to modernize at a profit. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.



got a job you can't swing?

New Britain tool rotating chuckers are designed for high speed machining of irregularly shaped pieces which cannot be rotated on standard machines, and for second operation bar work. Model 23B has four spindles and five chucks, one position being reserved for loading. It indexes up to 1250 pieces per hour. For any problem involving automatic chuckers New Britain is headquarters. Consult your New Britain representative or write The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.

The Care and Maintenance of Industrial V Belts is detailed in a 14-page illustrated manual issued by The B. F. Goodrich Co., Industrial Products Div'n, Akron, O. Among the topics covered are installation of

belts and how V belts grip. Featured is a V belt service chart which illustrates the typical causes of belt failure. **Inform-A-Gram No. C1.**

Hardness Conversion Tables for Steels are presented on a celluloid card supplied by The International Nickel Co., Inc., 67 Wall St., New York 5. The approximate relations between Brinell, Rockwell, and Shore Scleroscope hardness and corresponding tensile strengths of steel are given. **Circle No. C2.**

Classification and Symbols for Identification of High Speed Steels are found in a booklet from Le Vita Metal Alloy Co., 2980 W. Davison Ave., Detroit 38. **Circle No. C3.**

"Use of Light Waves for Controlling the Accuracy of Block Gages." This 44-page book written by Dr. F. H. Rolt, discusses interferometry as a method for measuring the length of gage blocks, using only the wave length of light as an absolute standard. The accuracy of determination is 0.000001". It refers in detail to the latest developments and describes a new interferometer which accommodates at the same time up to 36 standard gage blocks. The blocks are tested in the same condition in which they're used. Flatness and parallelism are determined along with length. Copies of the book are available from Engis Equipment Co., 431 S. Dearborn St., Chicago 5, or — **Circle Inform-A-Gram No. C4.**

How Granite Surface Plates Are Made is explained in a Collins Microflat Technical Manual. The illustrated 67-page manual tells how they're lapped to 0.000050 accuracy.

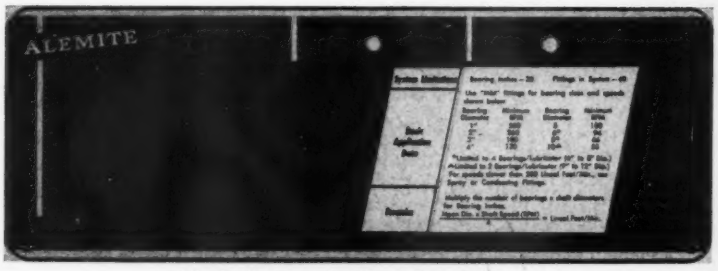
This manual may be obtained from Collins Microflat Co., 2326 E. 8th St., Los Angeles 21, or — **Circle No. C5.**

"Graphic Visual Control" describes the "Boardmaster" system and shows how to get things done quicker. The "Boardmaster" is a visual control system which can be used to picture various activities.

The operation of the tool is explained in detail with the aid of over 100 photos, sketches, and diagrams. Graphic Systems, 55 W. 42nd St., New York 36, will provide copies of the booklet, or — **Circle No. C6.**

Use Atomic Energy to See Through Metal. "Kel-Ray" projectors provide gamma ray sources for industrial radiography. Each projector is a shielded, self-contained source of penetrating radiation. A booklet discusses the projectors' operation and applications; their sources which are usually radioisotopes of cobalt, cesium, and iridium; and how gamma rays do the work of x-rays. Copies of the booklet are issued by Metal & Thermit Corp., 100 E. 42nd St., New York 17, or — **Circle Inform-A-Gram No. C7.**

This Oil-Mist Lubrication Slide Rule gives system limitations, basic application data, and the formula for anti-friction bearing; plain bearing; and slides, ways, vees, etc. The reverse side gives the same information for enclosed gears and chain, open gears and chain, and mixed systems. Used with it is an Engineering Data Book which explains the operation of the Alemite "Oil-Mist" lubricator and its applications. Both may be obtained from Alemite Div'n, Stewart-Warner Corp., 1826 Diversey Pkwy., Chicago 14.



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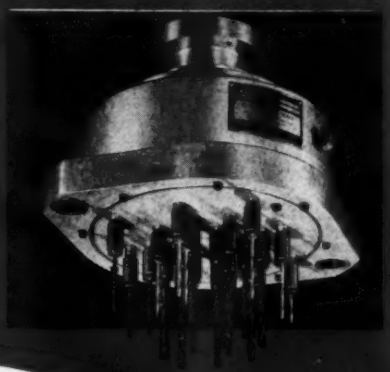

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Zagar meets every drilling problem with the most effective, low cost equipment: gearless drill heads, standard drilling machines, special drilling machines, and index, trunnion or pallet-type multi-station transfer machines. We can furnish the complete tooling if you desire. Perhaps Zagar drill heads can be installed profitably on your own drill press. Send us a drawing of the part you are planning to drill. Or, let us study your present situation with a view to reducing your drilling cost.

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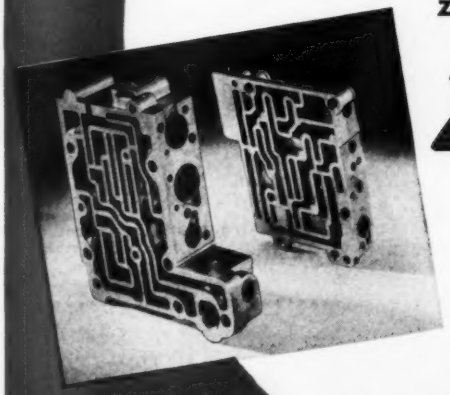
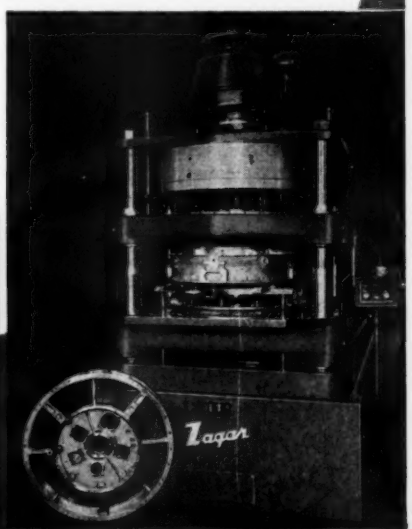
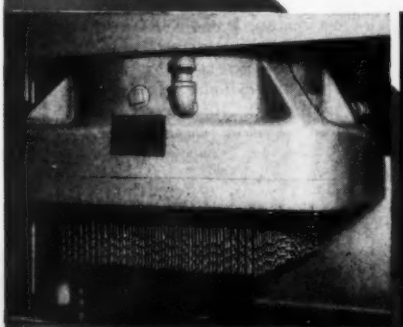
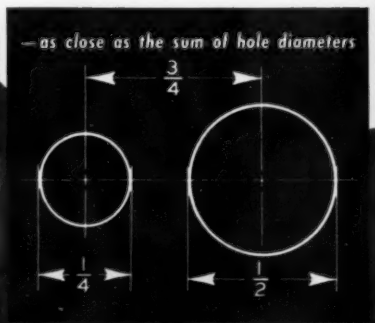


Any machinable material — from all angles.







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SECOND It is safe—safe for operator, safe for machine. Operating on low voltage (8 volts) it is free from electrical hazard, and electrical hook-ups can be made without conduit or heavy insulation.

THIRD It is rugged and durable. Operating records of 30, 40, 50 million or more cycles without maintenance expense are quite common. In fact, we guarantee the solenoid controls against burnout.

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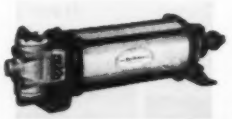

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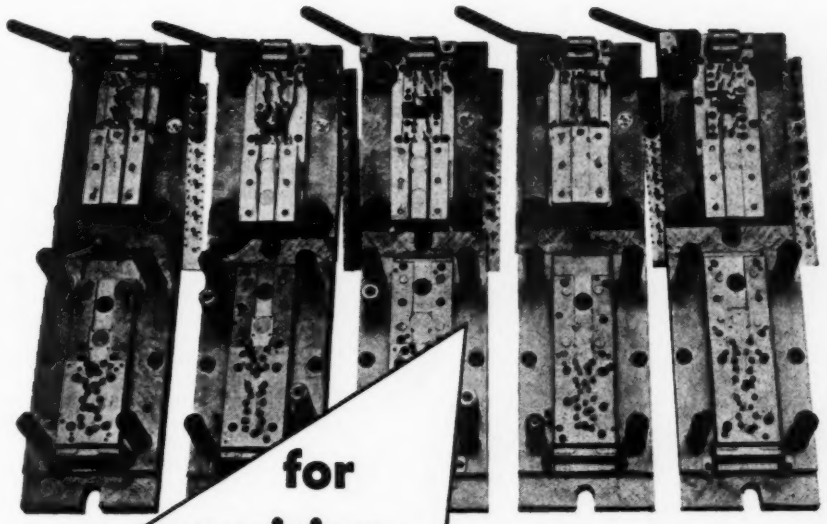

for precision jobs like this....Moore Jig Borers and Jig Grinders are "MADE TO ORDER"

NO. 2 MOORE JIG BORER. Range 10" x 16" x 16" height. Features infinitely variable spindle speeds, three power feed ratios, centralized controls.

NO. 2 MOORE JIG GRINDER. Range 10" x 16" x 16" height. Grinding speeds from 12,000 to 60,000 rpm. Infinite feeds up or down; spindle-housing heat control; features slot grinding attachment.

"HOLES, CONTOURS AND SURFACES

is bound to become a classic to the man or shop that does accurate work."

American Machinist Book Review

424 pages — $5 U.S.A., $6 elsewhere

Moore Jig Borers and Jig Grinders are made to order for jobs that require precision hole location—and plenty of it.

Take, for example, these five progressive compound dies used to pierce, shave, gut and blank intricate timing-device parts.

Holes in punch plate and stripper were jig bored in a No. 2 Moore Jig Borer. Holes in the corresponding die parts were jig bored in the same precision machine, hardened and then jig ground in a No. 2 Moore Jig Grinder. Perfect line-up was insured, since all holes had to be held to ± .0002", both for position and hole size.

The No. 2 Moore Jig Borer, with its built-in system of accurate lead screws, can spot, drill, bore or ream all holes in a workpiece to "tenths" with minimum tool changes. The No. 2 Moore Jig Grinder can accurately contour grind, slot grind and form grind die sections in a third of the time required by other means.

These Moore toolroom teammates provide a one-two punch that can knock the fat off your diemaking costs. They supply an *Engineered Hole Location Service* that permits tool and die sections to be produced concurrently...puts diemaking on an interchangeable-parts-and-assembly basis...lengthens die life...*saves you time and money* all along the line.

Write today for our detailed literature that pictures and describes many toolroom and production jobs for which Moore Jig Borers and Jig Grinders are made to order.

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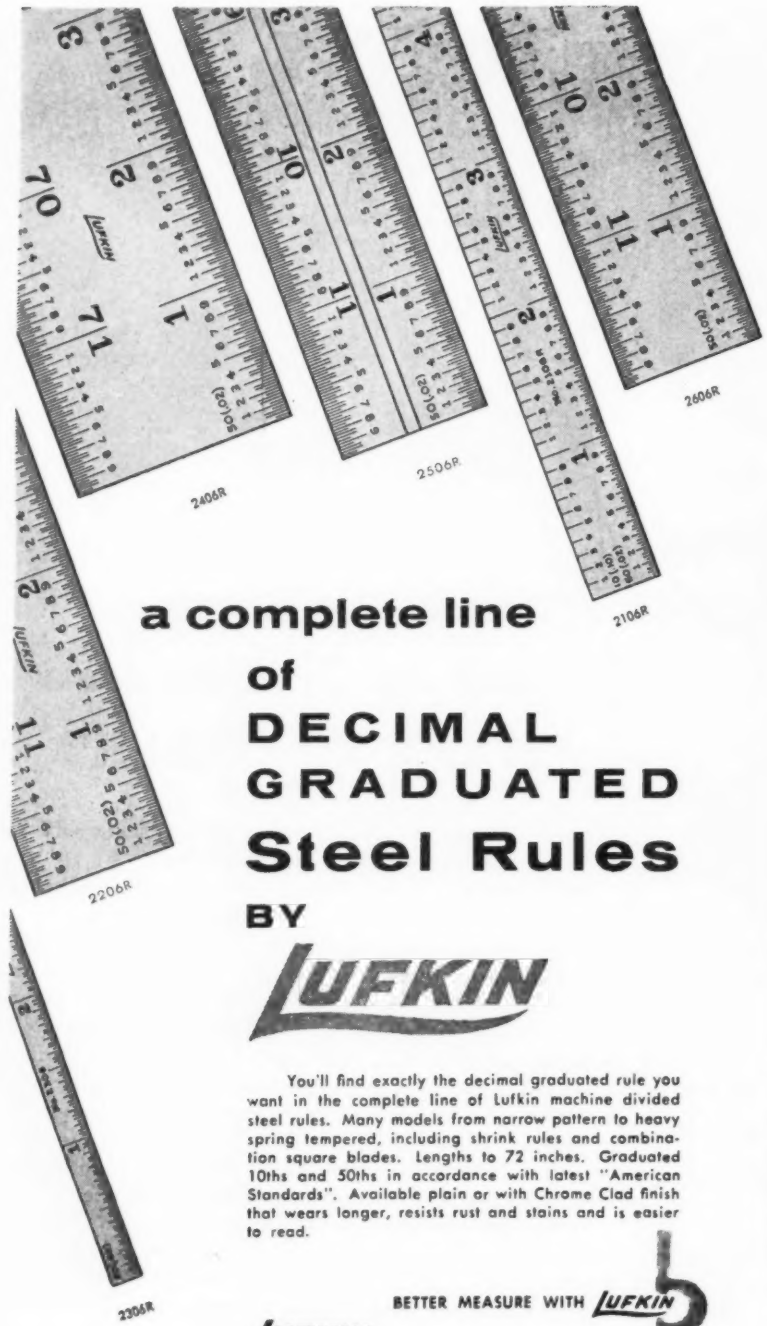

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. . . Month's Talk, from Page 52

But another reason is that there may be many potentially useful developments nearing the market stage which aren't yet talked about because industry doesn't like to talk about what it is developing until it is ready to offer its product for sale. The situation is a little like the iceberg, which shows only a portion of itself above the surface.

Man was fairly well, but not ideally, created for this world. The range of temperatures and of rainfall he finds agreeable but not necessarily entirely to his liking. With effort he can obtain what he requires of foodstuffs, clothing, and shelter. Also with effort and considerable knowledge he can take to the air or go on or under the sea. He has learned how to avert, cure, or mitigate disease.

But to an increasing degree man is altering the world to suit his needs. What will he be able to do once he has mastered the mysteries of atomic energy? His inquiring mind, his ingenuity and his persistence may well enable him to find many new ways to bend the materials and forces of nature more to his needs. Of many or perhaps most of such ways we are not yet even vaguely aware.

We know enough of atomic energy now to be optimistic about the future. The sign of the atom across the business world is a sign pointing to a vast new world awaiting man's efforts and control. What is there will keep the scientist gainfully employed, and it also will keep the business manager thinking and working too.

Films to See

In telling the story of Pratt & Whitney's Electrolimit jig borer, "Accent on Accuracy" presents a basic yet colorful picture of precision measurement in metal removal operations. A "must" for apprentice and other training programs, the movie reviews the history of the measuring bar and standard measuring machine, explains P & W's magnetic Electrolimit principle as applied to hole locating, and shows the production and use of jig boring machines for toolroom work and production. It's a 16mm color, sound film, available from Pratt & Whitney, W. Hartford 1, Conn.

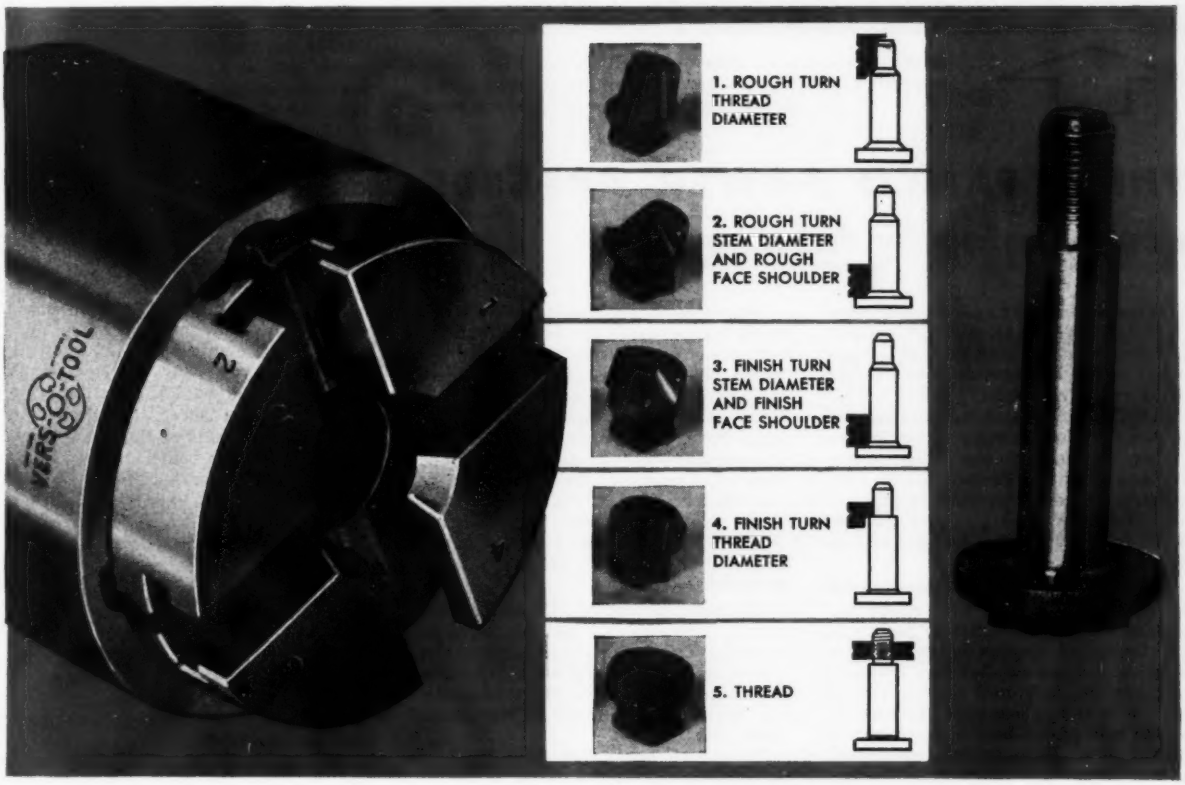
A new 16mm sound film, "Molding Phenolics," has been produced presenting a step-by-step discussion of the phenolic molding processes. It is available on a free-loan basis from Bakelite Co., Technical Film Library, 292 Madison Ave., New York 17.

"Forging in Closed Dies" is a sound and color movie that tells the story of drop forging. The 16mm film is loaned free of charge by the Drop Forging Association, 605 Hanna Bldg., Cleveland 15.

HERE'S HOW NAMCO VERS-O-TOOL

CUTS COSTS... SPEEDS PRODUCTION ON END TURNING AND FORMING

In this application 300 lever supports an hour are turned out on a vertical six-spindle automatic. Vers-O-Tool machines these steel forgings three times faster than single point tools, opens at the end of the cut, leaves no spiral marks on the work.


VERS-O-TOOL
1. ROUGH TURN THREAD DIAMETER
2. ROUGH TURN STEM DIAMETER AND ROUGH FACE SHOULDER
3. FINISH TURN STEM DIAMETER AND FINISH FACE SHOULDER
4. FINISH TURN THREAD DIAMETER
5. THREAD

Vers-O-Tool licks tough production problems because:

1 Basic Vers-O-Tool design permits cutters or ground thread chasers to be changed quickly without adjustment in the head.

2 All settings in the blocks are made in the tool-room with a micrometer gauge—no need for trial and error run after changing or grinding.

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The busy-bodies of power presses—two of 10 Famco 18 Ton Presses busy perforating high carbon steel for a new type 98 chrome oil ring at Perfect Circle's Hagerstown, Indiana plant.

THESE FAMCO POWER PRESSES *are running by themselves!*

It may seem odd to see a power press working with nary an operator in sight. Odd but effective. And profitable. As a result of the continuous stroke action of Famco's ELECTROMATIC CLUTCH, only *three* men are needed to run the *entire* battery of ten Famco Power Presses at the Hagerstown, Indiana plant of Perfect Circle Corporation. Presses are run 24 hours a day, 6 days a week . . . and, process 8,000 feet of high carbon steel ribbon per hour!

These Famco Power Presses are used to manufacture the ring spacer-expander for Perfect Circle's new type 98 chrome oil ring. A large die holds a series of three smaller dies arranged to perforate, form and restrike ribbon steel into the spacer-expander section at the rate of one inch for each stroke of the ram. Ram travel (crankshaft throw) is one-half inch.

But volume production with minimum labor is only one of the features of these busy-bodies of the power press world. The 9-point, electrically operated jaw clutch can be changed from single stroke to continuous action *while the press is running!* All Famco Presses have heavy, one-piece frames cast of semi-steel with extra heavy ribbing for added strength. Solid one-piece crankshafts are high carbon precision ground to assure perfect alignment. And there are many more exclusive features.

To really recognize the superiority of a Famco Power Press you have to see it in action. Then you'll realize the power it delivers with ease. Why it's called a busy-body. 50 models to choose from—the most in the small press field.

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DIE DESIGNING and ESTIMATING, Fourth Edition, compiled and edited by Watson N. Nordquist. Published by Huebner Publications, Inc., 1975 Lee Rd., Cleveland, Ohio, 1955. 368 pages, Price $7.50.

For many years **Die Designing and Estimating** has been widely used in schools and apprentice programs for both classroom and on-the-job training, and by die makers and die engineers as an authentic reference and refresher.

The 26 chapters of the Fourth Edition of the text are both an enlargement and a modernization of the previous editions, which have long been out of print. Since publication of the Third Edition, for example, the field of sheet metal fabrication by pressworking has grown and progressed. Much more of the fundamental information related to die design has become available and is included in the new edition.

While not all types of dies are dealt with to equal extent, the present edition offers a very detailed discussion of the principles involved in the design of what are generally considered the basic dies. Descriptions of many successful dies and limited discussions of the more common specialized types of dies supplement this information.

Some sections of this recent edition are completely new, as, for example, Chapter I, an "Introduction to Press Die Design." It has been included primarily for the orientation of student engineers, apprentices, and novice designers who have had virtually no exposure to presses or dies. A section on die engineering is included to help bridge the gap between basic terminology and practical design work.

Part II, Die Estimating, explains the now-famous Dannes System of Die Estimating, the first simplified approach to solving the very difficult problems of predetermining the cost of press dies.

Other subjects covered in the well-illustrated book include: Economical use of strip stock; step-by-step design of the basic dies; short run, lamination, and progressive dies; detailed descriptions of many successful dies; effective use of inclinable presses; factors affecting perforator life and failure; deep drawing technique; blank development; and determining press capacity. The book contains over 400 illustrations, charts, and graphs.

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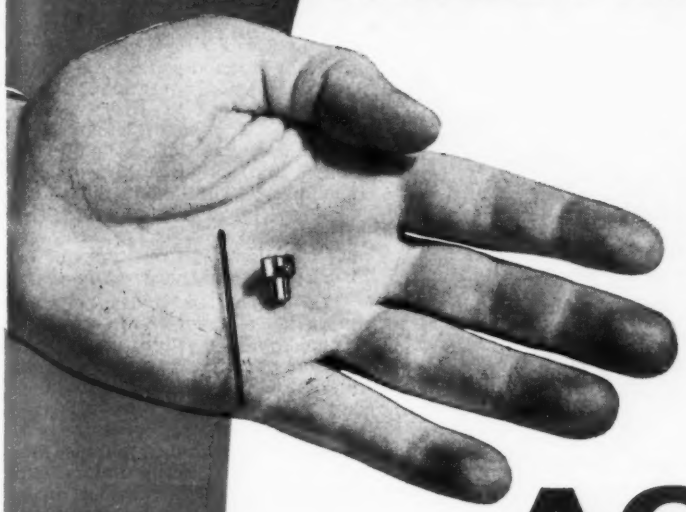

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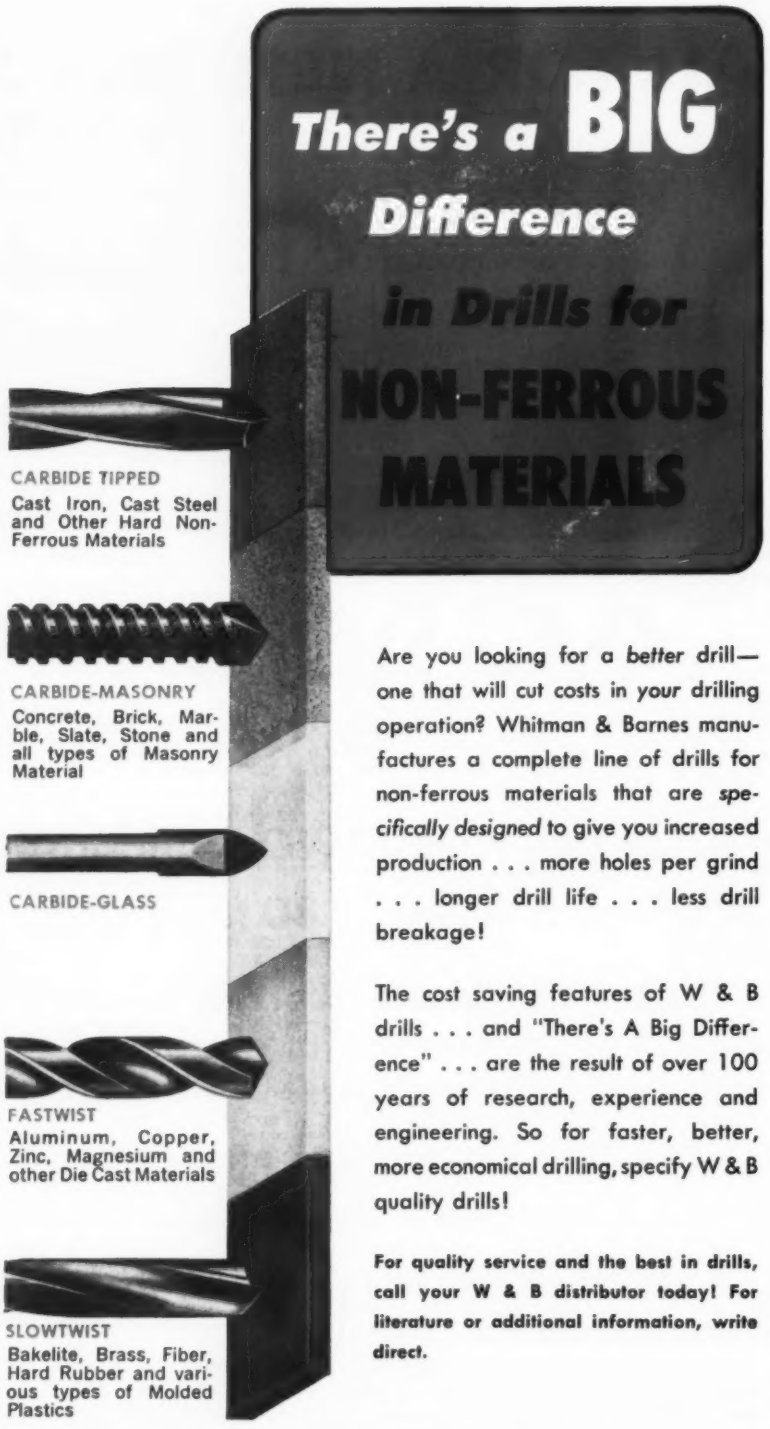
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HYDRAULIC AND PNEUMATIC POWER FOR PRODUCTION, by Harry L. Stewart. Published by The Industrial Press, 93 Worth St., New York 13, N. Y., 1955. 416 pages, Price $8.50.

H. L. Stewart's book satisfies the need for a good general reference that would supply information about the basic types of hydraulic and pneumatic equipment and ways in which they can be applied to the control and actuation of production machinery. The book is a comprehensive, well-illustrated, and clearly written reference for designers, buyers, installers, and operators of hydraulic and pneumatic equipment.

The chapter on hydraulic fluids, for instance, covers both petroleum oils and synthetic fluids. Along with a discussion of properties, common difficulties encountered with them and their remedies, are analyzed. Succeeding chapters cover the various types of hydraulic pumps, filter units, purifiers, accumulators, pipe and tubing, valves, cylinders, intensifiers, motors and heat exchangers. A chapter is devoted to the methods of synchronizing the movement of fluid power rams and another to hydraulic safety controls. Ways in which sequencing can be obtained by the use of hydraulic controls are also analyzed.

In the latter part of the book air filters, lubricators, regulators, controls and cylinders are taken up. Special chapters are devoted to pneumatic safety circuits and to remote control pneumatic systems. Even power holding devices are described.

The book contains 348 illustrations and circuit diagrams.

FREEHAND SKETCHING, by J. W. Giachino and Henry J. Beukema. Published by American Technical Society, 848 E. 58 St., Chicago 37, Ill. 94 pages, paperbound, Price $1.65.

Many times, words can't do the job adequately but simple sketches will. Sketching principles presented in **Freehand Sketching** should speedily develop one's basic sketching skills.

An idea of the book's "learner-orientated" plan can be gained from a review of Unit 3, "Making Multiview Sketches." This discussion of working drawings illustrates, verbally and in carefully integrated figures, the types and placement of views, hidden surfaces, kinds and weight of lines used, and dimensioning. Then, since this is a learn-by-doing text, 16 pages of practice problems at the end of the section test what has been learned. The reader can show that he has grasped the fundamentals and fine points by actually completing missing views, making three-view sketches of objects shown, filling in missing lines, and dimensioning.

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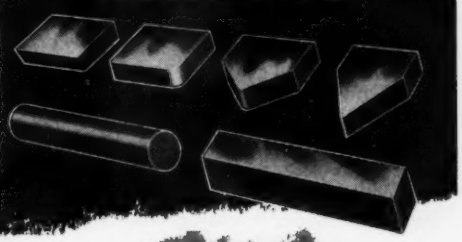

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The format gears visual aids to written material in a way which eliminates searching for examples.

Lettering a sketch, sketching sectional and auxiliary views and fastening devices, making pictorial sketches, and shading are all covered in the book.

ELECTRONIC DATA PROCESSING IN INDUSTRY: A Case Book of Management Experience, Special Report No. 3. Published by the American Management Association, 330 W. 42 St., New York 36, N. Y., 1955. 256 pages, Price $7.75. (AMA members, $5.75).

Years of man-hours and millions of dollars are currently being invested in electronic data-processing systems by "pioneering" firms. These and other companies are assembling answers to questions about management experience with electronic data-processing.

This new AMA publication describes how automatic data-processing offers speed, accuracy, control, and savings for industry. It gives specific, practical information on how to determine whether a company should adopt electronic data-processing; how to plan the installation of such systems; what automatic data-processing equipment is available; and how progressive companies are now using electronic data-processing in such specific fields as customer and general accounting, production planning, labor budgeting, and materials handling.

Reports of company experience with small, medium, and large computers are included, along with a summary of the evolution of data processing and its effect on company organization, a forecast of future developments in electronics, and a valuable glossary of programming terms.

NECROLOGY

Theodore Trecker, 87 founder and honorary chairman of the board of the Kearney & Trecker Corp., died in Milwaukee in December, following a long illness.

Henry H. Yerk, eastern sales manager for Niles machine tools, products of Baldwin-Lima-Hamilton Corp., died suddenly at his home in December.

Walter H. Dreis, 67, president, treasurer, and general manager of Dreis & Krump Manufacturing Co., Chicago, died in December.

Harold W. Faint, Chicago-Western States sales manager for the Metal Finishing Division of Frederic B. Stevens, Inc., died suddenly from a heart attack, Dec. 22.

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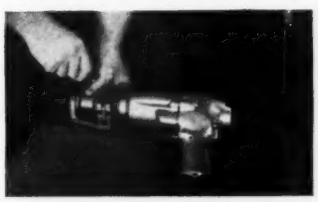

Torque can be quickly and easily set, using the jig as shown above. The torsion bar automatically shuts off the tool when the nut running resistance becomes equal to the stress in the preset torsion bar.

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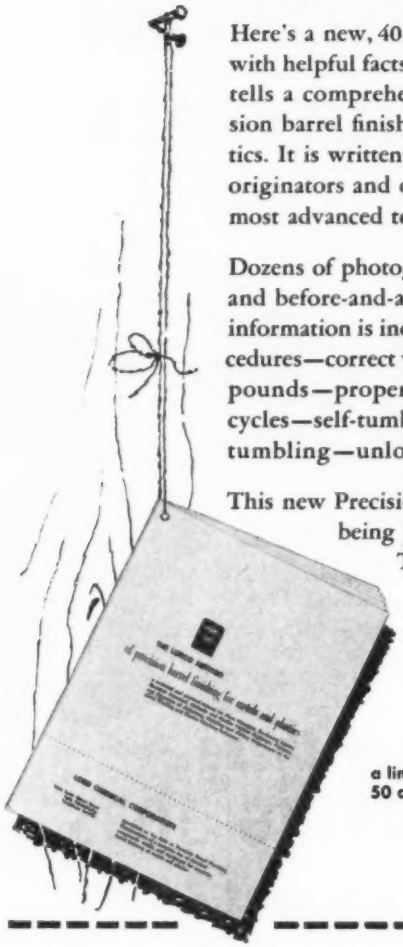
A NEW, COMPREHENSIVE MANUAL OF THE LATEST TECHNIQUES FOR PRECISION BARREL FINISHING METALS and PLASTICS



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Diamond Cutting Tools for Mirror Finish Machining

Diamonds, long neglected in many quarters as a cutting tool material, is currently enjoying a revival of interest. Accelerated production of intricate mechanisms and a general trend toward miniaturization of instruments have broadened Industry's need for ultra-close tolerances and machined surfaces of mirror-finish smoothness. The optical and watch industries, of course, are long-time users of diamond tools.

Hamilton Watch Company of Lancaster, Pa., recently announced that its Allied Products Division is now in commercial production on a line of diamond tools for machining small precision metal parts.

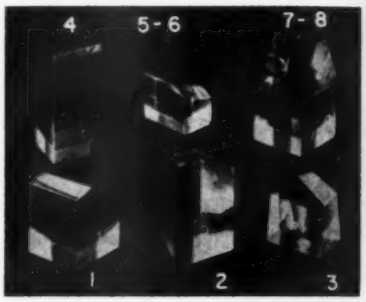
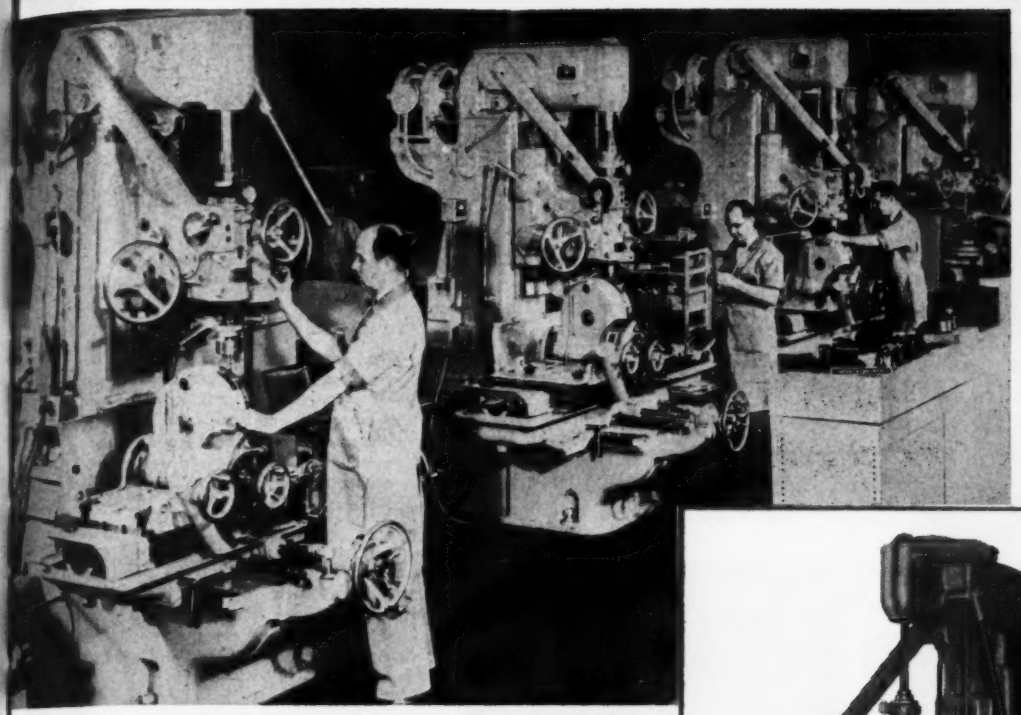


Fig. 1. A few of the various types of diamond turning tools produced for close-tolerance machining and production of mirror finishes include those for (1) rough turning diameter of balance wheel, (2) facing arm of balance wheel, (3) countersinking screw holes in balance wheel, (4) cutting inside chamfer on balance wheel, (5-6) finish cutting outside diameter and facing balance wheel, and (7-8) cutting outside chamfer on balance wheel.

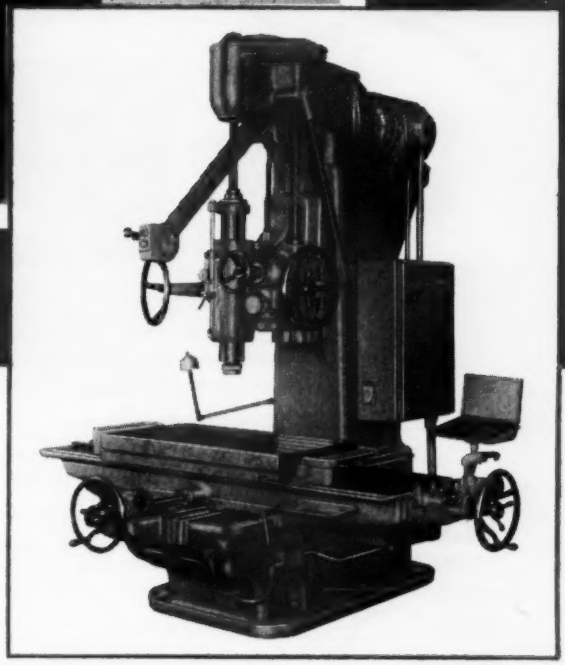
Turning tools (Fig. 1) are available for any type of cut-off operation and for finishing of flat surfaces or bevelled surfaces of any desired bevel angle. The line also includes a series of laps (Fig. 2) for machining the inside surfaces of holes to achieve precise diameter and very fine finish, and a variety of discs and wheels for precision external machining. These laps are available in sizes varying from .018" to 2.250" dia.

The turning tools are produced by a special manufacturing procedure which includes examination of the diamond by X-rays to determine the arrangement of its atom planes, then orienting these planes in the tool so as to produce exceptionally long tool life and an extremely smooth machined surface. The laps are produced by a process of mixing diamond dust with powdered metal



A section of the Woodward Governor Company plant in Rockford, Illinois showing a line of four P&W No. 2A End-Measure Jig Borers equipped with P&W Precision Tilting Rotary Tables.

WOODWARD GOVERNOR COMPANY USES



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TURRET DRILL CASE HISTORY No. 26

MANUFACTURER—Clifford Manufacturing Company, Waltham, Massachusetts

PART—Tellurium Copper Forging

FIXTURE—Single position, bolted to machine table

OPERATIONS

1. Load.
2. Combination center and countersink, 750 r.p.m. Index.
3. Rough drill .285 diameter, 550 r.p.m. Index.
4. Drill ⅛" diameter, .440 deep, 1450 r.p.m. Index.
5. Drill #53 .610 deep, 2875 r.p.m. Index.
6. Finish counterbore .285 diameter, .250 deep, 1000 r.p.m.
7. Unload and Clean.

Production Rate	On H&F Turret Drilling Machine	On Conventional Multiple Spindle Drill Press
Pieces per hour	30	16
Inspection	10%	100%
Rejects	1.5%	10%

Note that the H&F machine has increased production 87%, cut inspection time 90% and rejects 85%. As the parts are worth $12 each, the savings in rejects alone paid for the H&F machine in 6 months.

COMMENT With the H&F machine, each spindle works on a common axis and runs at an optimum preset speed to an accurate preset depth. • The work is correctly positioned for each operation by a fixture bolted to the machine table. • Production is substantially increased because no time is lost moving work from spindle to spindle or sharpening tools dulled by contact with jig bushings. • Rejects are virtually eliminated because correct spindle speeds and accurate alignment of tool and bushing produce straight holes with a good finish. • Let H&F save money for you. • Write for catalog and further time studies.

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Fig. 2. Laps of metal-bonded diamond powder (foreground) are used for accurate internal grinding of hard metals, carbides, and cermets. Discs and wheels (background) processed similarly are used for external machining of ultra-hard tool and die materials.

and sintering the two to produce a small metallic cylinder with diamond particles firmly bonded into it. The discs and wheels are also produced by this sintered-metal bonding process.

Hamilton's diamond tools for metal turning have found wide application for machining soft (non-ferrous) metals to very close tolerances (tenthousandths of an inch), and for producing a machined surface so smooth that no polishing or other finishing is required. The diamond laps are used extensively for producing holes of precise diameter and smooth finish in metal dies used for precision metal stamping. And all of the metal-bonded diamond tools (laps, discs, and wheels) are finding increasingly important application in the metal-working field because they permit machining, to a high finish and to very close tolerances, the new super hard tool and die materials such as carbides and cermets.

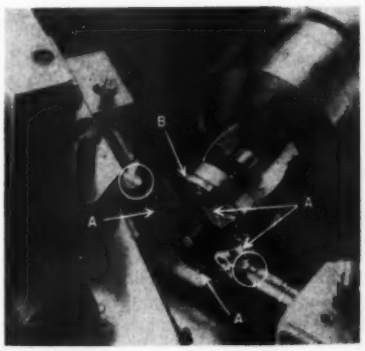

Fig. 3. Extra-smooth finish on metal parts results from extremely smooth edge of diamond tools. Here, four watch sub-mounting plates (A,A,A,-A) are being simultaneously machined with diamond cutting tools (circles) to produce extra-smooth bevel edge.

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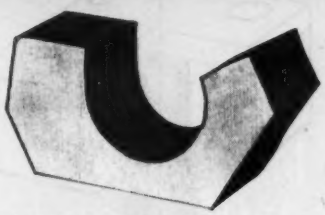
PARTS SHAPED FASTER WITH Demon HIGH-SPEED STEEL SAW BANDS



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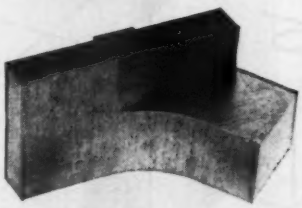

NOW 28 min. with Demon Saw.
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Knee Turner
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The revolutionary Demon High-Speed Steel Saw Band and its companion, the versatile Contour-matic Band Machine, make it possible to cut critical parts from solid steel or steel forgings faster than has ever been possible before!

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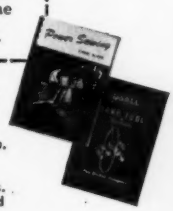

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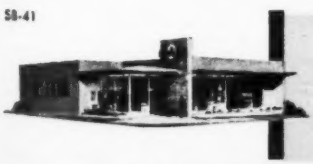

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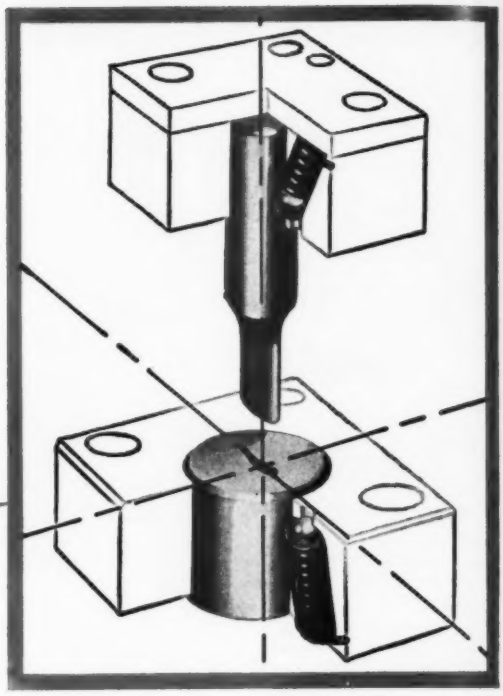

Just a push, a twist, and "click" your R-B punch or die button is accurately ALIGNED and LOCKED in place. The R-B ball lock prevents radial or vertical movement of the punch or die button in the retainer—no additional keying is required.

R-B punches and die buttons are just as easy to remove—simply insert tanged tool in retainer hole to release ball lock. Standardized and completely interchangeable in any shape or size, these easy to use punches and die buttons save your time and energy.

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CIRCLE INFORM-A-GRAM KEY NO. 1101

P-K® ASSEMBLY ENGINEERS ARE TRAINED TO HELP YOU DESIGN BETTER PRODUCT FASTENINGS AT LOWER COST

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CIRCLE INFORM-A-GRAM KEY NO. 1111

I've been making tools for wire and ribbon metal forms long enough to know that A. H. Nilson Fourslides are the most adaptable and produce parts most economically. For easy set-up and tool adjustment, accurate feed, and rugged design . . . Nilson Fourslides are my choice.

Look at the part shown on the left . . . made in our Nilson #S-O Fourslide. Better than 5,000 of these are produced per hour *automatically* from coiled stock using .039 dia. tin-plated copper wire, and this tops any previous production method.

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Automatic Chain Making Machines : Staple Forming Machines : Wire and Stock Reels : Wire Straightening Equipment : Slide Feeds for Presses
CIRCLE INFORM-A-GRAM KEY NO. 1121

PREVENTIVE MAINTENANCE FOR INDUSTRIAL TRUCKS

Fourteen ways to lower operating costs of electric industrial trucks have been outlined by Charles Greener, general service manager of the Automatic Transportation Company, Chicago.

Planned preventive maintenance assures reduced service budgets, longer truck life, and less downtime while trucks undergo repairs, Greener said. His program for one-truck or fleet operations, based on studies of successful techniques, includes these recommendations:

1. Loads should suit the truck. Teach your operators that truck capacity varies with load length, and that continual overloading causes serious breakdowns and plays havoc with tire bills. Use trucks with ample reserve capacity.

2. Keep floors as clean as possible and in good condition. Bad surfaces cause damaging strains and shocks, and again your tires suffer unnecessarily.

3. Replace tires when they develop flat spots or when big chunks of rubber are gouged out. Stretching tire use damages the truck, costs you far more in repairs than you think you are saving, and is bad for driver health and efficiency.

4. Let the right man — a mechanic — do repair work. When something goes wrong, have your operator call the mechanic, and don't let him have the truck pushed or towed without the mechanic's orders.

5. Your operators should be trained thoroughly in proper use of equipment assigned to them. Whenever possible each man should work permanently with the same truck.

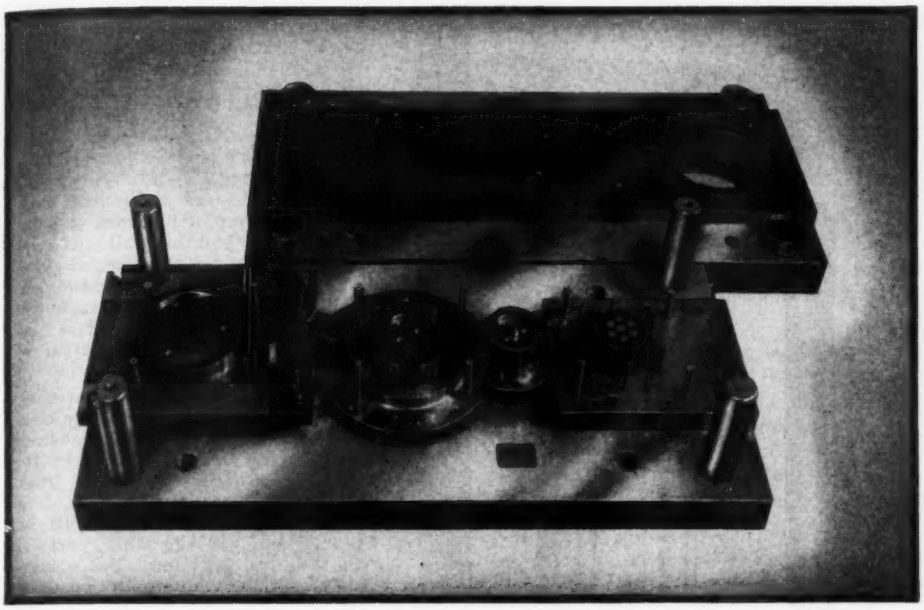
6. When you get a new truck, be sure to obtain full information about it. Have the manufacturer's service representative demonstrate it for your operators. He should advise your maintenance force, explain spare parts needs, and make sure no damage was incurred in shipment.

7. Your mechanical maintenance program, whether large or small, should follow a regular schedule. Use a series of mechanical worksheets or tags prescribing services to be performed. Keep a fleet maintenance record to learn the life expectancy of important units of the truck. This enables you to make necessary changes in advance to avoid complete breakdown, preventing loss of operating time.

8. Trucks need a monthly lubrication and mechanical check, usually requiring about an hour and a half, which should follow removal of dirt

Although a steel die costs less initially, this . . .

Carbide-equipped die pays off by outproducing steel die 10 to 1



Precision lamination die, equipped with Carboloy cemented-carbide cutting edges. Produces one million rotor and stator parts per grind, compared to only one hundred thousand per grind with a steel die.

The initial cost of this lamination die equipped with Carboloy® cemented carbide is about twice that of a steel die. But because the carbide die produces 10 times as many parts per grind, the initial investment is more than returned in downtime and grinding savings alone.

This is what the 10 to 1 ratio means to a plant: grinding expense reduced 90%; downtime reduced 90%; output per shift increased; grinding facilities freed for other tasks; scrap reduced because the carbide die holds its accurate tolerances longer; costly finishing work eliminated because parts are burr-free.

Actually, this case history is one of the less spectacular recorded on dies equipped with Carboloy cemented carbide. On many applications — large and small, simple and complex — carbide dies outproduce, outlast steel by margins as high as 50 to 1.

No matter what the job — drawing, forming, blanking, or piercing — Carboloy carbide-equipped dies have more than proved their value. Consult a Carboloy Engineer today. He will be happy to work with you or your diemaker on design and application problems. For more information, write or send the coupon below.

"Carboloy" is the trademark for products of the Carboloy Department of General Electric Company

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DEPARTMENT OF GENERAL ELECTRIC COMPANY
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- ☐ Send me Carboloy Die Engineering Manual D-124.
- ☐ Send complete details on Carboloy Die Training School.
- ☐ Have a Carboloy Die Engineer call at my plant.

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CARBOLOY CREATED-METALS FOR INDUSTRIAL PROGRESS

CIRCLE INFORM-A-GRAM KEY NO. 1131

When it comes to SOLID CARBIDE PRATT & WHITNEY offers YOU the RIGHT TOOL... for Your Job

Lasting up to 200 times longer than high speed steel and able to lower production costs tremendously, carbide *IS* the tool of today and tomorrow!

But — you *can not* simply remove the high speed tools and replace with carbide. Additional power is required to drive carbide efficiently; speed, feed and chip load must be carefully correlated with type and depth of cut, finish required and many other factors. The correct grade of carbide for *each* application must be determined.

Now — traditional Pratt & Whitney cutting tool know-how and experience, supplemented by a 10-year program of special research and development in carbides, bring you this assurance: the *RIGHT* carbide tools for your specific jobs. Send us your work blueprints and acquaint us with type of machines involved. We will be glad to submit our job recommendations.

PRATT & WHITNEY COMPANY
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MACHINE TOOLS • GAGES • CUTTING TOOLS

and grit from the under-carriage. Fleet operation calls for a cleaning rack in a small room or enclosed area. A weak alkaline solution applied under steam pressure does a good cleaning job, and compressed air is best for drying. After the mechanical check, lubricate the truck. Make a large blow-up of the manufacturer's lubrication chart so your maintenance men can follow it easily. During the check, put the truc through its paces thoroughly in all speeds, and with a normal load.

9. Semi-annual mechanical checks and lubrication are more extensive. Included are cleaning and repacking wheel bearings, changing drive axle grease or oil, and any other services not assigned to the short-term checkups.

10. Electrical checks should be conducted on a weekly, monthly, and semi-annual basis. The weekly check includes tightening loose fittings and replacing worn or damaged ones. Monthly, all electrical operations should be observed closely, and semi-annually, the complete electrical inspection will save you money. Tightness of electrical connections and proper insulation o. wires should be noted carefully.

11. Be careful with your batteries. Overwatering will weaken the electrolyte, and when it spills over from the battery case, the electrolyte causes corrosion of other truck parts. Flushing the battery is a necessity, as the battery must be kept clean. Make this part of the weekly inspection. Use properly maintained automatic charging equipment.

12. General overhauls should be scheduled according to your operating conditions, such as the number of hours the truck works daily, plant conditions, and the driver's ability.

13. Keep a weekly log for each truck, on which you record inspections, lubrications, and cleanings. This permanent record will help you make sure necessary preventive maintenance functions are performed.

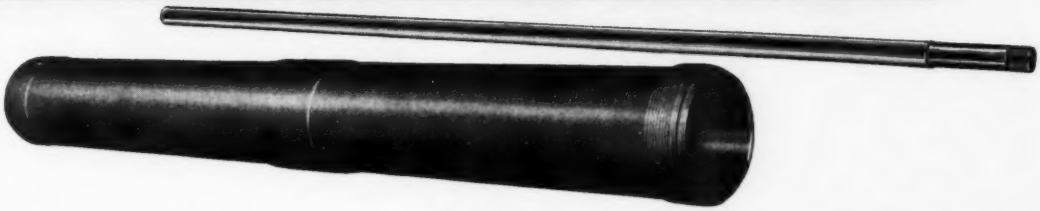
14. The program outlined above is based on one shift a day, and favorable operating conditions. Under rough conditions, such as bad floors, more than average dirt, or more than one shift a day duty, trucks require more frequent use of some or all of these checks. It is wise to consult with the manufacturer's service representative in regard to this.

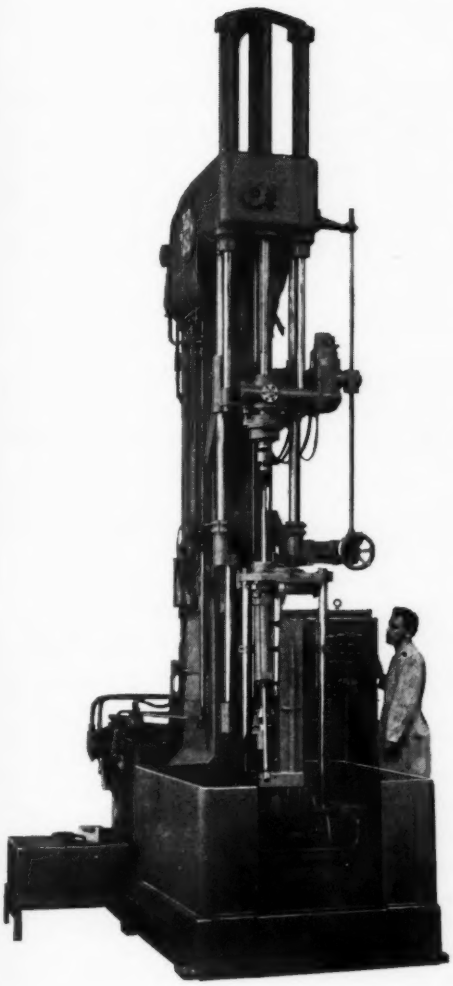
Greener recommends that truck users treat preventive maintenance as a money-saving part of their operation. Properly conducted, it will permit finding out which operators are not doing their jobs well, which trucks are assigned to jobs for which they are not fitted, and what changes can be made in truck design to improve their utility.

—— • ——

MICROHONING*...

Efficient Stock Removal with LOW-VELOCITY ABRADING





INCREASINGLY, process engineers are recognizing Microhoning's low-velocity abrading technique as a means of combining efficient stock removal with precision.

The Brooklyn Works of American Machine & Foundry Company, in the precision-manufacture of recoil mechanisms for artillery weapons, required a process that would most efficiently remove substantial amounts of stock and generate functional surface characteristics on the I.D. of recoil cylinders and O.D. of piston rods. After extensive study of available methods, AMF selected Microhoning as the most productive and economical process for obtaining desired results.

The floating piston in the recoil cylinder has nitrogen gas on one side and hydraulic oil on the other. Because silver ring seals are used, any error in geometry or roughness of cylinder or rod surfaces will induce deformation or scoring of silver rings and break these important seals.

The largest cylinder processed by AMF to date is for a 75 mm gun and has a bore diameter of 4.750 inches and a length of 46 inches. Piston rods for this gun are 1.375 inches in diameter and 56 inches long. Both I.D. and O.D. operations are on the same Microhoning machine—Model 450 Hydrohoner.

The Microhoning process efficiently removes up to .026 inch of stock from cylinders and .006 inch from rods to correct waviness, taper and out-of-roundness. A geometric tolerance of .0001 inch is held while obtaining a 1.5 microinch finish.

Working closely with AMF manufacturing personnel, Micromatic developed fixtures and tooling that minimize changeover time. The fixture for the cylinder is mounted on an indexing table so it is simply indexed away from the spindle while the rod is being Microhoned. You, too, can solve your precision stock-removal problems through application of Microhoning—the low-velocity abrading process.

For further information write for CROSS-HATCH, Vol. 7 No. 5

***MICROHONING=**
Stock Removal + Geometry + Size Control + Surface Finish

MICROMATIC HONE CORPORATION

8100 SCHOOLCRAFT AVENUE • DETROIT 38, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1181

Elox Uni-Form single point
grinding fixture used
on standard EDM grinder.
Left: Elox ground single point tool.
Right: Standard ground tool.
Note smooth even cutting edge and
radius of Elox ground tool as
compared to standard ground tool.
(Unretouched photo).

grind 2 faces and radius on 1/2" x 1" carbide insert in 3-1/2 minutes automatically . . . repetitively . . . without variation . . . without heat checks . . . without manual assistance!

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Elox Electrical Discharge Machining of single point tools is an electronically controlled push button operation. Variable human elements are completely eliminated, guaranteeing every tool sharpened identical as to finish, radius. Grinding is done with a brass wheel to any pre-determined specifications. Every tool repetitively uniform!

Advantages of Elox Uni-Form Tool Grinding:

- **Permits use of standard blanks**
- **Every tool is identical as to radius, finish**
- **Increased tool life**
- **More regrinds per tool**
- **Eliminates diamond wheels**
- **Carbide and tool shank are ground simultaneously**
- **Averages 40% labor savings**

See Elox Uni-Form Single Point Tool Fixture in operation at Elox Demonstration Centers.

Elox Electron Drill equipment for removing broken taps, drills, etc. from $495 to $3450.

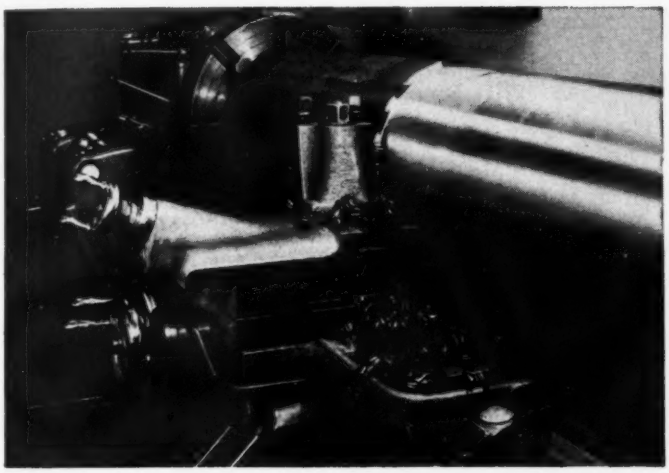
*T. M. Reg.

CIRCLE INFORM-A-GRAM KEY NO. 1161

NEW...ALL NEW!

FIRTHITE TXH

A heavy-duty, general purpose premium Carbide at no premium price



OUTSTANDING FEATURES OF TXH

- Higher hardness to strength ratio.
- Improved impact resistance.
- Wider range of applications.
- Cooler operating temperatures.
- Higher edge strength.
- Greater resistance to abrasion.

TXH is new, brand new, not just another grade designation for an altered existing grade. It is a completely new concept . . . a combination of materials and processes designed specifically to do heavy duty, high production cutting operations better than they have ever been done before. It does.

During development in Firth Sterling laboratories, FIRTHITE TXH *out-performed* and *outlasted* all other *premium grades of carbide.* After thorough introduction in the field, performance has exceeded laboratory predictions in case after case.

Here is a premium quality carbide developed for an age of automation which, at no extra cost, out-performs and outlasts all others.

Available from stock now in all standard tips and tools. Try it *now* and *prove it yourself!*

FOR ENGINEERING SERVICE CALL YOUR NEAREST FIRTH STERLING REPRESENTATIVE

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CALL YOUR FIRTH STERLING DISTRICT OFFICE OR DISTRIBUTOR. ASK MR. TOOLEY.

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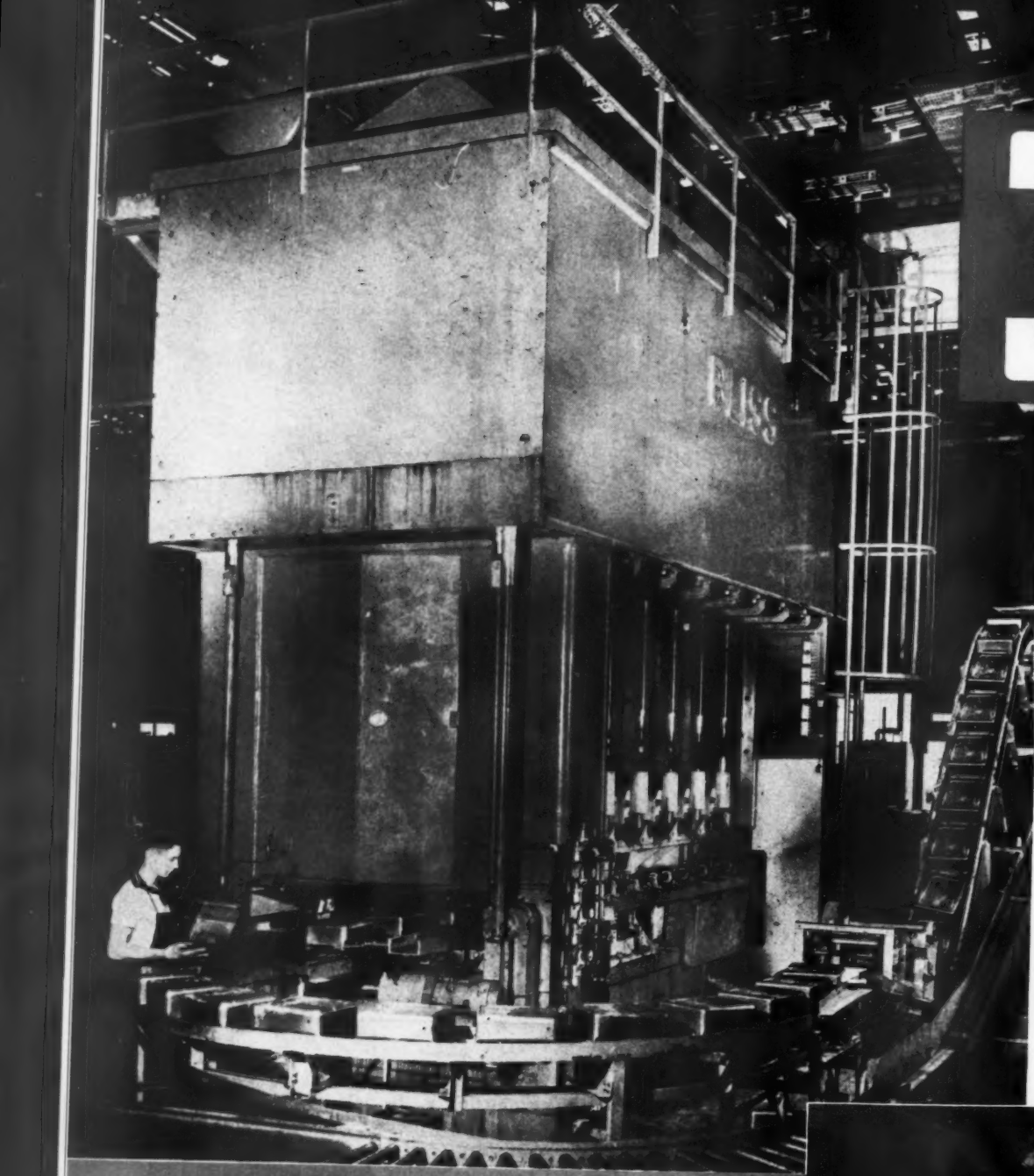
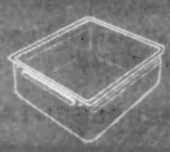
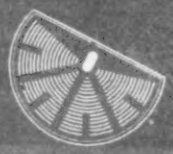




THIS ONE MAKES PANS . . . Pans are produced at the rate of ten a minute in this 700-ton seven-station Bliss transfer feed press. A 22" x 24" blank is drawn 5⅜" deep in the first station; trimming, piercing and restriking operations follow. Pans leave the press completely finished — ready for pickling and enameling.



THESE TWO MAKE SHELVES . . . "Lazy Suzan" shelves by the millions are the product of these two 800-ton Bliss transfer feed presses and the two Bliss embossing presses stationed at their output ends. Coil stock is blanked in the first stations of the presses and work pieces carry through the remaining five stations and into the embossing press automatically. Each press produces 15 shelves per minute through two shifts.

BLISS TRANSFER FEED PRESSES STEP UP GE REFRIGERATOR PRODUCTION

Between them, they make all the pans and all the shelves GE needs for its annual output of more than half a million refrigerators!

Here's what's happening at Appliance Park: 6000-pound coils of steel feed into one end of these Bliss transfer feed presses, lines of shelves and pans march out the other ends, and only a few attendants stand by in between.

Three separate press lines are involved. One is a 700-ton, seven-station press (with coil cradle, straightener and roll feed) that produces ten deep-drawn pans a minute.

The other two — identical set-ups — are 800-ton, six-station presses, also with cradle, straightener and feed, which feed into 800-ton embossing presses (see photo). Each produces shelves at the rate of 15 per minute.

The method of operation is the same for all. Mill coils are loaded on the cradle. From there, strip feeds through the straightener and into the roll feed. At the first die station in the press a blank is cut off. The transfer feed fingers move in on the work piece and carry it to the next station. As the slide comes down, the fingers move out; as it rises, they move in and repeat the cycle. New strip is brought to the first station and a completed part delivered with every stroke of the press.

This set-up has solved a number of knotty problems for General Electric. Previously production required the services of two or three vendors, doubling and tripling the cost of dies and labor. Still further savings have come from the use of standard mill coils instead of blanks. In fact, the savings are expected to bring about an early amortization of the entire installation.

Bliss has been building transfer feed presses and systems like this since Spanish-American War days; today, over a thousand are in use. If you're faced with long-run production problems, let a Bliss engineer show you some typical uses of the transfer feed principle. Perhaps it can pull your production costs into line — as it has for so many others.

SEE IT IN ACTION . . . *A new color-and-sound movie takes viewers to the plant, shows the press in action. See close-ups of tooling, of transfer fingers, of coil feed techniques. To arrange a showing at your plant, write to E. W. Bliss Company, Canton, Ohio, or see your local Bliss representative.*

BLISS
SINCE 1857

E. W. BLISS Company, Canton, Ohio

PRESSES, ROLLING MILLS, SPECIAL MACHINERY

is more than a name... it's a guarantee

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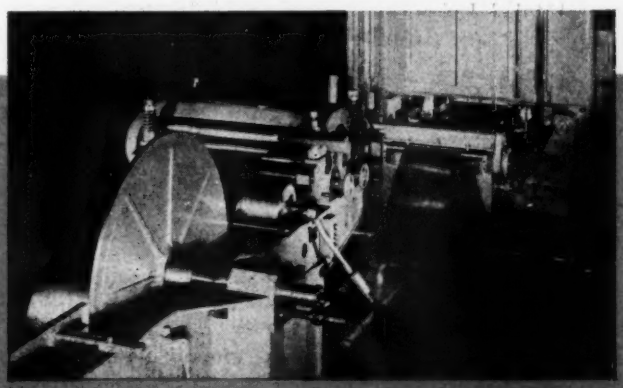


ALL THREE LINES WORK FROM COIL STOCK . . . A number of handling operations are eliminated because, on each of the three presses, strip from standard-sized mill coils are fed from this power coil cradle through a five-roll straightener and into the roll feed on the press. Blank is cut off in the first die station of the press. Though not shown here, a second coil is ordinarily held ready at the rear of the cradle to speed handling. Bliss engineers designed all the coil handling equipment and all of the tooling for each of the presses.

DRexel 6-4222

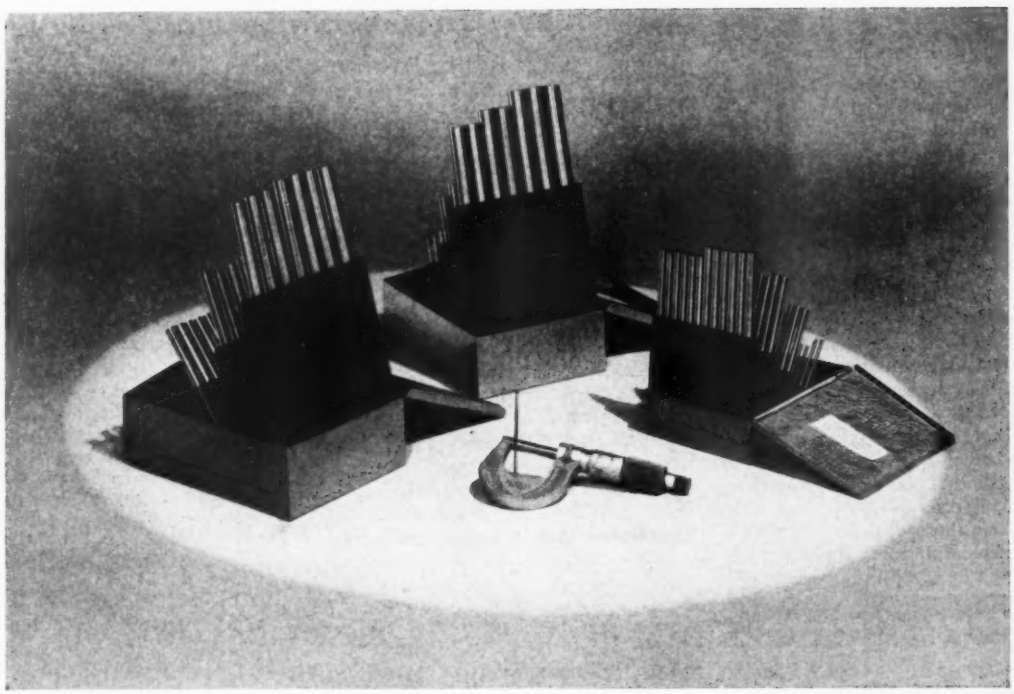
WM. T. HUTCHINSON CO.

53 BROWN AVE.

SPRINGFIELD, NEW JERSEY

ESTABLISHED 1927

HUTCHINSON HSS BLANKS



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JOBBER SET	LETTER SET	WIRE SET
$32.27	$29.03	$27.40
in Huot Index	in Huot Index	in Huot Index

(PRICES SUBJECT TO QUANTITY DISCOUNT)

HIGH SPEED STEEL — 64 "C" scale hard — gage tolerance — mirror finish.

parallel ground +.0002 —.0000

ANY DECIMAL DIAMETER OF STANDARD LENGTH
.020" TO .750" SHIPPED ON 24 HOUR NOTICE

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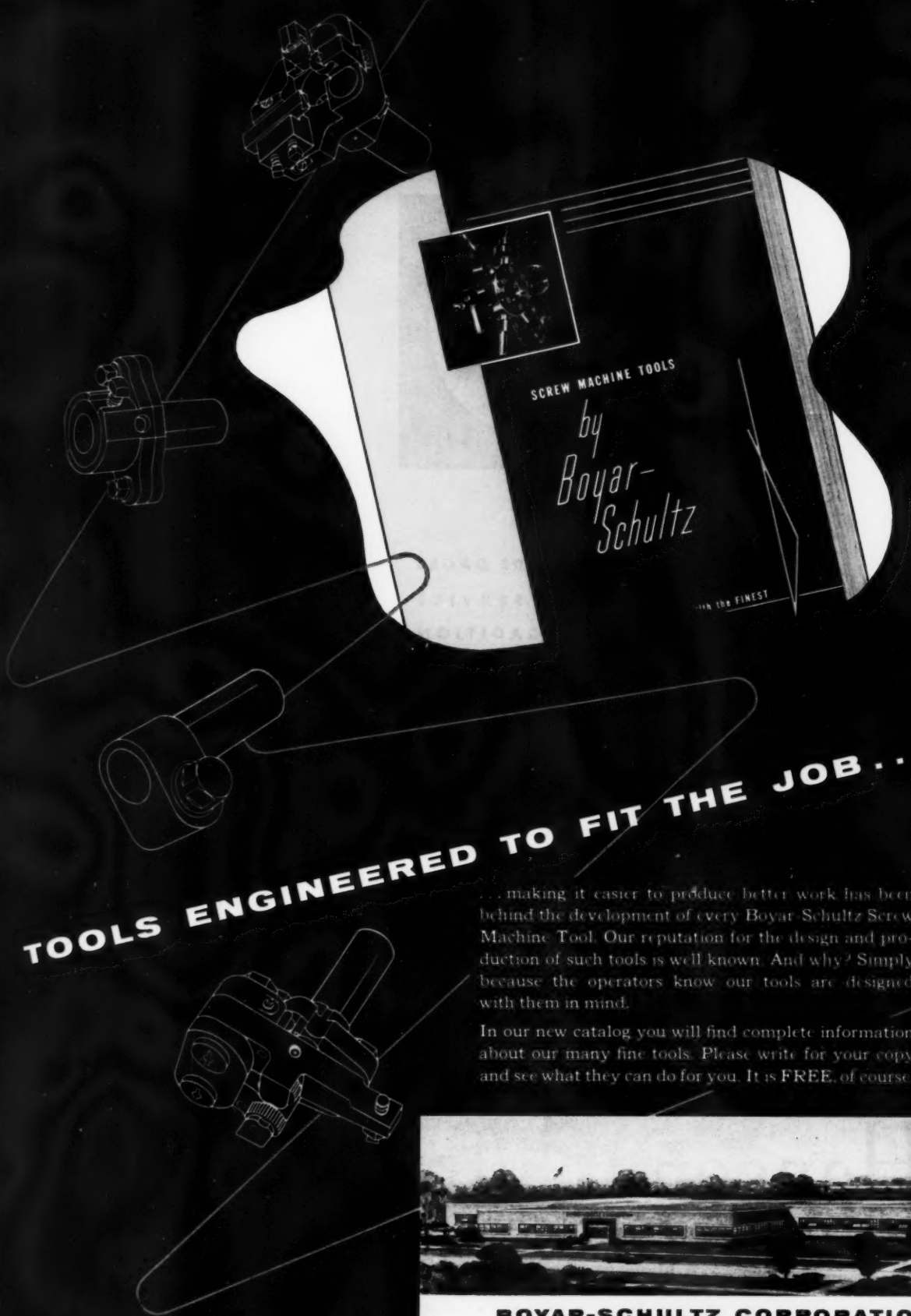

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. . . making it easier to produce better work has been behind the development of every Boyar-Schultz Screw Machine Tool. Our reputation for the design and production of such tools is well known. And why? Simply because the operators know our tools are designed with them in mind.

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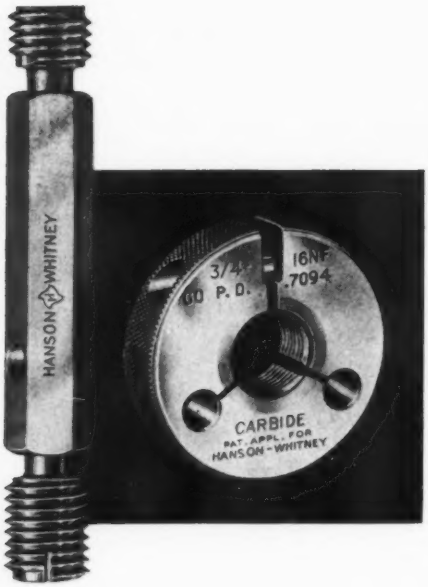

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CIRCLE INFORM-A-GRAM KEY NO. 1221

PREDICTS NEW 'WORK MORALITY' WITH AUTOMATION

Automation will revolutionize current standards for judging a worker's performance, it was predicted recently by Dr. Adam Abruzzi of Stevens Institute of Technology's Department of Industrial Engineering in an address at an American Association for the Advancement of Science meeting in Atlanta, Ga.

Mass production methods have broken down manufacturing processes into simple steps that can be performed by workers with little skill or preliminary training, Dr. Abruzzi pointed out. Under this system, the sole criterion for judging a worker's value is the quantity of work he turns out. In a fully automated factory in which machines instead of workers perform "trivial" tasks, he said human performance must be judged on something other than quantity, because the self-regulated machines alone will determine the size of output.

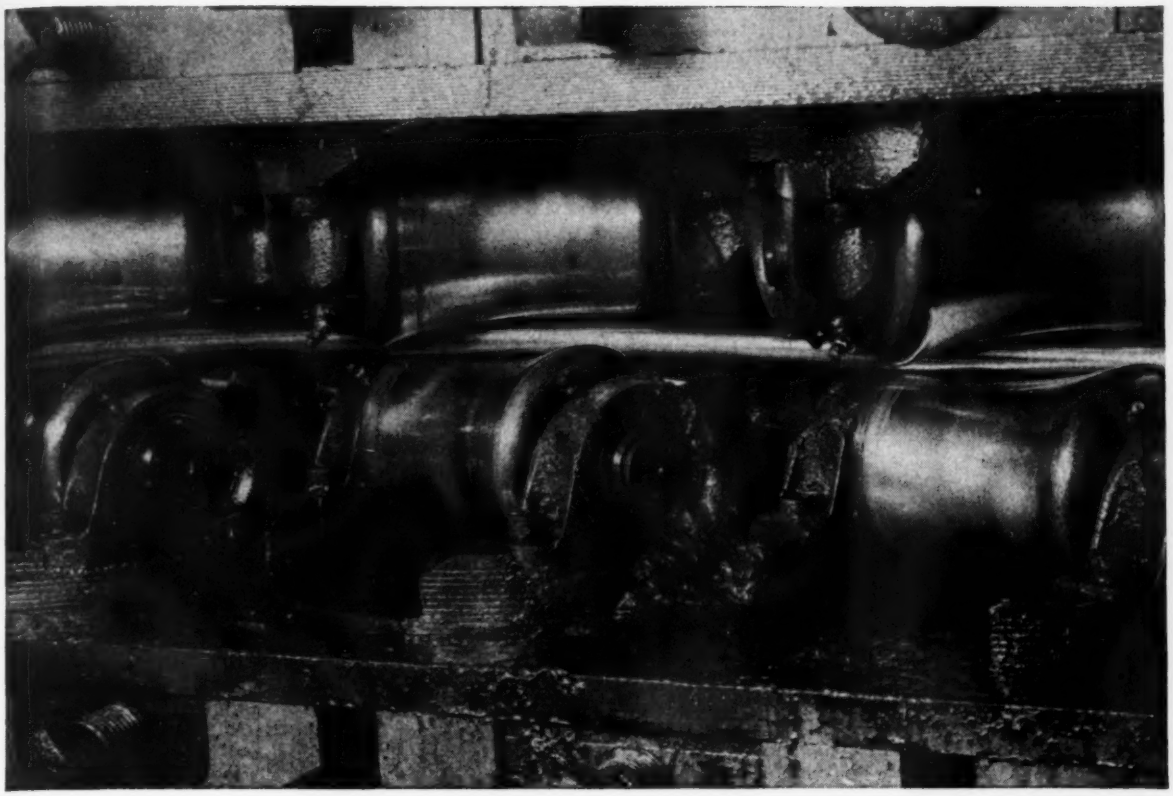
Future judgments of a worker's performance, Dr. Abruzzi said, will be based on his ability to control the automation process and to prevent it from breaking down. This will require the worker to have "distinguished controlling skills," enabling him to diagnose the source of trouble in a breakdown and to take swift, remedial action to overcome it.

The "overseer-controller" on the automated production line, Dr. Abruzzi said, "will have, perhaps, an even more important prognostic or preventive function: Evaluating operating situations that might lead to breakdowns. He would then take preventive action to see that the breakdowns do not occur. An effective overseer-controller will thus have idle hands but a productive mind rather than productive hands and an idle mind."

It is this ability to control activity, he maintains, through the use of "distinguished skills" that will form the basis for judging a worker's value.

Adoption of these new standards of worker evaluation will lead in turn to what Dr. Abruzzi terms a "new work morality" to replace that defined by the phrase "the devil finds work for idle hands." With the advent of the automatic factory physical labor will no longer be the highest form of moral righteousness.

"Idleness will still be sinful, but it will refer to idle minds, not idle hands. Toil will still be virtuous, but it will then refer to productive minds not productive hands."



Uses tool steel that outwears others 3 to 1 for its straightener rolls

TO help its customers get the longest possible life out of the rolls used in its small tube straighteners, Mackintosh-Hemphill Division of E. W. Bliss Co. makes them from Graph-Mo® steel.

Graph-Mo contains millions of tiny particles of diamond-hard carbides. As a result, users report it outwears other tool steels on an average of three to one!

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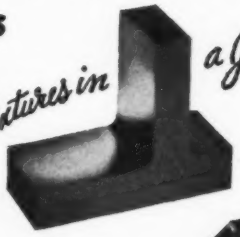

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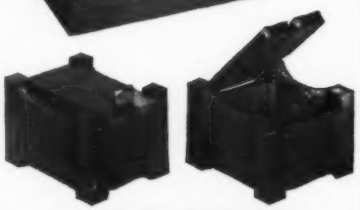

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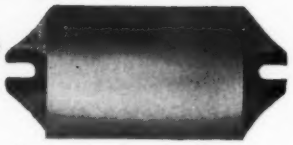

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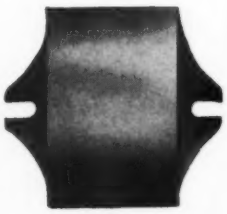

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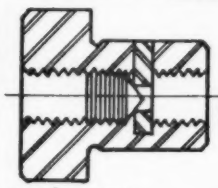

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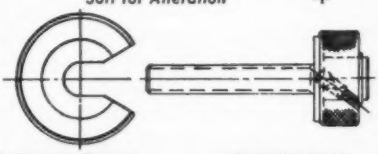

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A4	A23	A42	A61	A80	B17	B36	B55	B74	
A5	A24	A43	A62	A81	B18	B37	B56	B75	
A6	A25	A44	A63	A82	B19	B38	B57	B76	
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A9	A28	A47	A66	B3	B22	B41	B60	B79	
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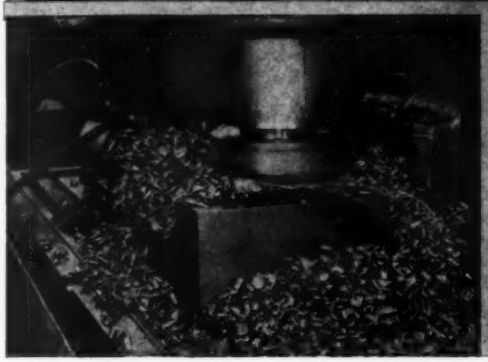

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. . . Preformed Carbide Parts from Page 70

standardization scale, and the percentage is reduced as the grade goes toward C-9 (maximum hardness).

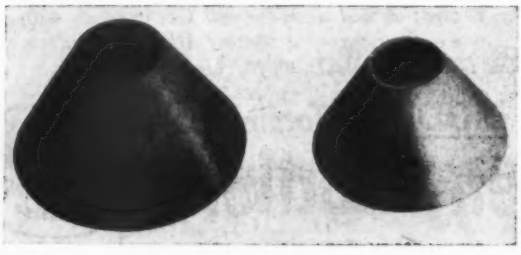
Tapers, slots and holes can be successfully incorporated into preforms. However, difficulty arises when a combination of these modifications produces an overhang. Again, it is frequently advisable where close-tolerance dimensions are required on the finished piece to leave small modifications for finishing to size by grinding in the hardened state.

Another point to consider is the specification of two holes in relative location to each other. This again is influenced by the shrinkage problem. It is difficult to hold relative location of holes closer than ± 0.020″ in common practice. When holes must be located to closer tolerances than this, it is usually preferable to make the holes undersize and grind to tolerance. Where steel parts must match carbide parts, it is generally advisable to machine the steel afterward to fit the carbide. If this is not possible, a useful technique is to make the hole in the carbide oversize, then after sintering braze a steel plug in place and finish the hole in the steel.

A common condition which causes unnecessary expense is the specification of small preformed relief angles (under 5°) on narrow tool tip faces under ⅛″ thick. The preforming of such angles is often a superfluous operation, particularly where the pieces are to be brazed onto steel shanks. In many cases the entire carbide form must be ground after sintering anyway to bring the tool to final dimensions, and small relief angles on thin tips can be added in this operation rather than in the preforming. Where larger angles and thicker tips are involved, of course, it usually pays to preform the angles.

Careful dimensioning frequently results in a considerable reduction in the purchase price of a preformed part. Where dimensions and fits are critical, this should be fully indicated on the part print. Thus the carbide technician can take such conditions into account when preforming the part and may be able to reduce the cost. Also, adequate finishing stock allowances can be made. It would also be very helpful if the designer would specify which dimensions and surface locations are not "fussy" or critical.

Fig. 4. This conical tungsten carbide part with a hole through the center presented no unusual difficulties or expense. If it had not been preformed, it would have been extremely costly.



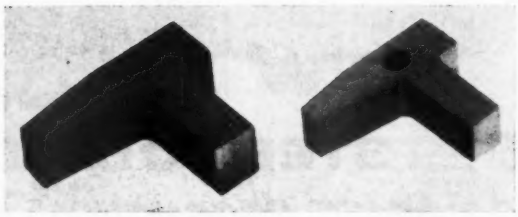


Fig. 5. While the form of this part is quite complex and includes a hole, the part could lie flat in the sintering furnace and no difficulties were experienced in making it.

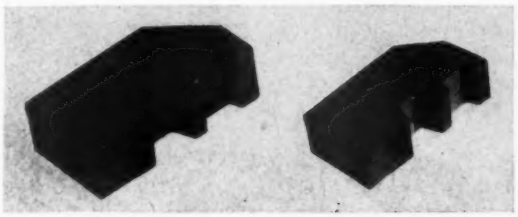


Fig. 6. This part presented no difficulties in preforming techniques. The amount of shrinkage experienced can readily be seen between the unsintered piece at left and the finished part at right.

Here is a list of "Do" and "Don't" suggestions that will be helpful to the designer in taking full advantage of the cost saving offered by the preforming process:

DO

Specify the **related** tolerance of the various surfaces.

Specify the precision of final finish required on each surface.

Specify any critical dimensional conditions that must be met.

Specify the amount of grinding stock to be left on each surface where such is critical.

Also, and this is perhaps the most helpful suggestion, consult with your carbide fabricator before finalizing specifications for complicated preforms, particularly when needed in large quantity.

DON'T

Specify more precision than you need. It costs money.

Specify minor alterations indiscriminately.

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. . . Trepanning from Page 74

operation. It should be applied in the ratio of 12 to 15 parts of water to one part base oil. A synthetic type of oil blended with a wetting agent and a lubricity agent rates high in giving both good finish and long tool life. The quantity of oil should be large enough, and the pressure high enough to chill the chips, making them sufficiently small to flush them away from the cut as rapidly as they are formed. Pumps having a capacity of 75 to 150 gallons per minute, operating at 300 psi, are used successfully for producing deep holes.

In case a rotating trepanning head is inclined to give an objectionable vibration or chatter, such as might develop from the torque effect of the drive tube when trepanning deep holes, it is advisable to use a steady rest to vibration dampener. It should be located between the guide bushing and chuck, and provided with a split bronze bushing, with facilities to place a variable pressure on the rotating drive tube.

There is real economy in producing holes by trepanning, and for this reason this method of machining should always be given heavy consideration. A recent interesting case covers the making of a somewhat complicated, fabricated steel part. The part was redesigned, incorporating the use of a steel casting, and trepanning a 14″ dia blind hole in one operation. It also involved the modification of an old heavy-duty engine lathe for the trepanning operation on several similar parts with several size holes. The real surprise came when it was found the trepanning idea was responsible for reducing a 300-hr machining operation to only 8 hrs. The resulting part not only was produced faster, but the resulting hole was more accurate in size, concentricity, alignment and finish than obtained by the previous method of machining. The part also was better because the use of steel weldments were no longer required.

Carbide Tooling for Low Speed Machining Tests

Machining crankshafts at low speeds with cemented carbides, contrary to user experience to date, not only is feasible but also economical production-wise, according to recent tests conducted in the machinability lab of Carboloy Department of General Electric Company, Detroit.

Proper tool geometry, according to Carboloy engineers, is the secret to low speed machining. This, coupled with honing the cutting edge, provides such good carbide tool life that it is entirely possible machining speeds for such operations can be boosted from 60 to 70 sfpm, to around 180 sfpm.

Tests at Carboloy were conducted on three different categories of work materials. They included forged steel, cast steel and malleable cast iron crankshafts. The forged steel crankshafts proved the most difficult to machine, paralleling field experience.

Good tool life, however, was obtained with a negative 5° rake angle tool, its cutting edge honed at 45° to produce a 1/64″ land. The carbide used, grade 370, produced over twice the tool life of high speed steel under low speed cutting conditions of 60 to 70 sfpm.

Tool life on cast steel crankshafts was even better, using the same grade of carbide. The malleable cast iron crankshafts machined similar to ductile cast iron giving a somewhat continuous chip. In this instance, it was found that grade 883 carbide gave extremely long tool life. It was also indicated during the tests that if the crankshaft machines were run at maximum speed, from the time the tool entered the cut at the cheeks down to the surface of the crankshaft bearings, much higher production rates would be possible when using carbides.

During the tests, crankshafts were chucked on center in a 20″ engine lathe, and interrupted turning cuts were taken along outer extremities of the crankshaft. This produced the effect of passing in and out of the scale, and gave an interrupted cut similar to that taken when facing cheeks of crankshafts in the perpendicular direction.

The forged steel crankshafts were of SAE 1046, and had a Brinell hardness range of 217-255. The cast steel shafts were Osco-80 with a hardness of 229 Bhn. The malleable cast iron crankshafts included a chemical composition of carbon 2.55, silicon 1.40, magnesium 0.45, sulphur 0.12 and phosphorus 0.05. Their hardnesses ranged from 197-241 Bhn.

At the beginning of the tests, typical user experience was reflected in attempting to use carbides at low speeds. These same speeds, 60-70 sfpm, normally cause the built-up edge to weld to the cutting edge, resulting in failure by chipping.

Good tool life was experienced when geometries of grade 370 carbide were modified to a 5° side cutting edge angle, 5° end cutting angle with a negative 5° land, 1/64″ wide. This gave a tool life of over 135 min in the cut compared to about 35 min for high speed steel. It also was found that complicated grinding of the land could be eliminated by using either throw-away insert tools or 1½″ tangential insert tools.

Grade 370 carbide throw-away inserts with 5° back and side rakes and lands honed to 1/64″ not only provided good tool life at the slow speeds but also indicated possibilities of operating crankshaft machines at maximum speeds throughout the whole cutting cycle.

This would make it possible to use a single-speed, alternating current motor on the machine, rather than a two-speed drive, and to increase production rates.

The malleable iron crankshafts were easy to machine under all conditions. No built-up edge was apparent and the low speeds did not seem to bring about chipping. The test indicated that grade 883 carbide with no special tool grinding gave the best life.

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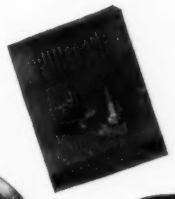

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. . . Error Diagnosis from Page 76

the cutting edge due to its minute crackings, caused by working intermittently hot (no cutting fluid) and cool (under cutting fluid stream). (11)

Bad tool setting, e.g. too big tool overhang, or too much play (7), may easily produce chatter and thus cause breakage or chipping of the tool edge. A similar influence can also be caused by a too low setting of the tool (8), which increases the breaking action of the chip pressure on the edge.

Carbide Tip Cracking

Quite generally, carbide tip cracking might be caused either by a mechanical or a thermal shock and might lead to edge chipping or to tool breakage. We will not discuss here the causes producing cracking in the sense of a slight error of the kind discussed previously by breakage and chipping. Rather, we shall concentrate on errors causing tip cracking due to a thermal shock, which does not produce any breakage or chipping at all.

We remember that the carbides are sensitive to non-uniform temperature changes which means that they are brittle to thermal shocks. This property may be only increased by the difference in thermal expansion coefficient between the carbide tip and the steel shank. (Steel expands approximately twice as much as carbide.) Thus the joint influence of these factors might cause internal stresses due to bad brazing (other than "sandwich" brazing which provides a deformable layer between the shank and the tip to absorb these stresses), or due to bad grinding and a localized over-heating or burning of the tool. (9)

A like influence can also prevail if we allow the tip to be excessively overheated by the heat generated by work (10). The tip, being heated from one side by the edge rubbing against the removed chip and against the machined surface, is cooled from another side by the heat dissipation provided by the thermal conductivity of the steel shank. If the difference between the temperatures involved becomes too great, the tip will crack. A like, but more severe influence might be produced by a bad (interrupted) use of cutting fluid, as already discussed. (11)

Built-Up Edge

The **built-up edge formation** may be caused, first of all, by a too high chip pressure, due in its turn to a too low or negative side rake angle (12), causing an excessive chip.

The built-up edge formation might also, up to a certain amount, be caused by a too soft carbide grade (13). This might be the case when machining steel, as the **specific pressure welding temperature** of carbide and steel increases usually with the carbide hardness. It is evident that a decrease in this hardness and a drop in welding temperature can only facilitate a built-up edge formation, although this possible influence must not be exaggerated.

Anyhow, the most frequent cause of the built-up edge formation lies in a too low cutting speed (too long duration of chip/cutting edge contact) and, in a certain amount, a too fine feed per revolution or per tooth (a thin chip is more plastic and enters better in a very intimate contact with the tool edge). (14)

Too Rapid Tool Wear

Wear Land on the Relief Face. Excessive wear of the relief face can, first of all, be caused by tool rubbing instead of cutting. This takes place when we try to cut too thin a chip. In such a case, the cutting edge tends to cold work the machined surface rather than to remove a chip from it. This might be due to one of the following tool errors:

1. The lead angle is too big, and the angle between the axis of the turned workpiece and the cutting edge is too small, so that the resultant chip thickness is too fine. (15)

2. The nose radius is too big, so that, practically, the effective lead angle on certain sectors of the cutting edge approaches 90°. (15)

3. The applied carbide grade is too brittle; the wear on the relief face being due more to the purely mechanical abrasion than to the pressure welding. (16)

It is also evident that, for a given cutting tool, its relief wear depends very highly on the working conditions. In particular:

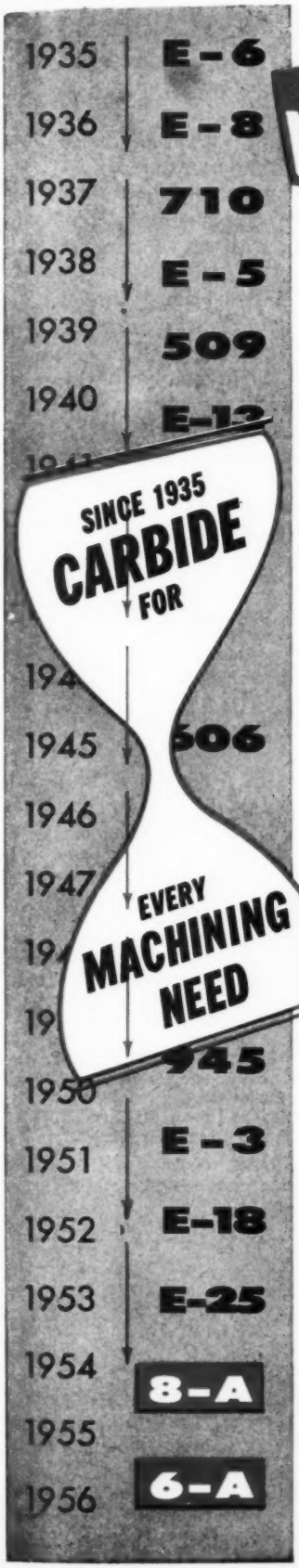
4. Too high cutting speed causes an increase of the cutting temperature (measured on the tool nose) and causes, therefore, more rapid tool wear. (17)

5. Too fine feed, even if it does not cause a rubbing of the tool edge against the machined surface, increases the specific chip pressure (measured in p.s.i.) and, therefore, increases the tool wear per pound of removed chips. (18)

6. In all the cases where we are anticipating the danger of side pressure or side wear, as, for instance, in deep hole drilling, a strong fatty protective film is necessary and can only be assured by the use of an adequate cutting oil. (19)

7. Finally, a too high setting of the cutting tool will result in a larger rubbing contact of its relief face against the machined surface. (20)

Wear Crater on the Rake Face. Crater formation takes place on the rake face of the



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cutting tool and is due to the rubbing action of the removed chip sliding against this face.

The progress of this kind of wear could be too rapid if the chip pressure is too high, due to a too low or a negative rake angle and, in consequence, severe chip deformation. Also, it could be too rapid if the cutting edge is too pointed and does not allow a sufficiently rapid dissipation of the heat generated on the tool nose. In both cases, excessively rapid tool wear is due to bad tool shape. (21)

It is evident that wear progress depends very highly on the carbide grade applied. The wear resistance against cratering is too low if the carbide grade selected is not hard (and wear resistant) enough. (22)

The depth of the eroded crater increases, of course, with the chip pressure, an influence which is directly proportional to the feed actually applied. Thus, too rapid cratering might be reduced by a simple feed reduction. (23)

The application of a cutting fluid (a water emulsion) has, of course, an influence on the tool wear, which always decreases with the drop of cutting temperature. (24)

And last, a too high tool setting can cause rapid tool wear, both on the relief and on the rake faces. (20)

Practical Conclusions

It is not possible to give a complete and a very concise answer to many questions at the same time. The present report has to serve as a general guide only. A supplementary study of technical literature is necessary for its better understanding.

It should also be remembered that the investigation of only one single error at a time is possible. Therefore, if the presence of several errors is supposed, their elimination has to be undertaken gradually, one after another, starting with the most important one.

The nomenclature for tool angles and faces used in this report are taken from the American Standards, as applied in "The Manual on Cutting of Metals" of the A.S.M.E., or in different carbide manuals, edited by different carbide makers, where many supplementary details, not discussed in this short report, are described.

Two Dissimilar Parts Machined at Same Time

Two dissimilar parts are drilled, reamed, and counterbored on the 36-spindle tooling shown in Figure 1. Built for a leading refrigeration and air-conditioning manufacturer, this special Thriftmaster drillhead is a complete unit including drill bushing plate (at right, Fig. 1), index table (center) and fixtures. A 12" scale under the drillhead gives an idea of its size.

The head features standard Thriftmaster fixed center, full ball bearing construction. Spindles are held within .001" of location. The spindles, gears, and other steel parts are made from fully heat-treated chrome-moly steel, which provides sufficient reserve strength to break a tool without damage to working parts of the head. All 33 spindles have vertical and depth adjustment, and each spindle is operated at the desired speed.

All rotating parts are mounted in pre-loaded ball bearings to provide sustained accuracy over a long-period of continuous high production operation. The head is lubricated by

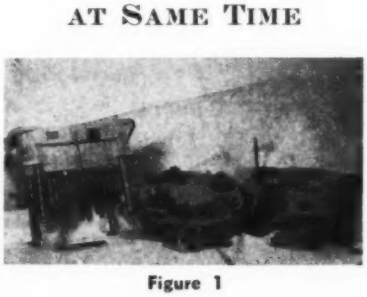


Figure 1

means of a circulating oil pump. To reduce friction and thus eliminate the heat so generated, slingers are used throughout the head instead of oil seals.

Fixturing on the 4-station, ball bearing index table, Figure 2, accommodates two dissimilar workpieces (shown in front of table) at each station. The front station is for unloading and loading, the other three for machining.

Approximate location of the manually operated index table is obtained by a spring loaded plunger. This location is sufficiently close to permit four hardened rods in the head to engage hardened bushings in the fixture, thus providing exact location.

This 36-spindle drilling unit is typical of the special drillhead designs executed by engineers of Thriftmaster Products Corp., 1012A N. Plum St., Lancaster, Pa.

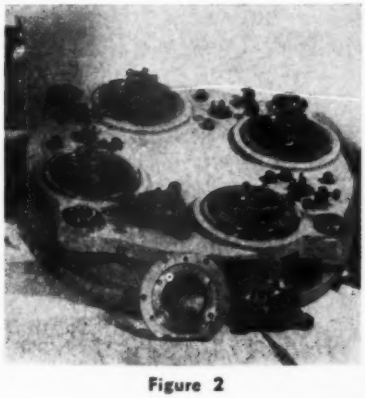


Figure 2

"Commendable Comments"

"The germination and cultivation of a future engineer or scientist should begin in the upper elementary grades and should not be delayed until he enters high school."

—From an annual report by Dr. John T. Rettaliata, president of Illinois Institute of Technology, Chicago, Ill.

"Anyone who has introduced a brand new material to the U. S. market will testify that education of many people about that product was one of the toughest jobs they faced."

—From the Acceptance speech by Dr. W. R. Collings, on receiving the 1955 Award for Chemical Engineering Achievement, Bellevue-Stratford Hotel, Philadelphia, Pa.

"To maintain our relative position in the world economy and to preserve our high standard of living, American industry must — ten years from now — produce forty per cent more than it does today."

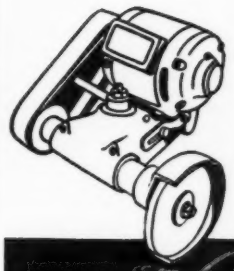
—By Rear Admiral H. G. Rickover, USN Chief, Naval Reactors Branch, Div. of Reactor Development U.S. Atomic Energy Commission at a luncheon sponsored by The Thomas Alva Edison Foundation, Inc.

"I was struck by what appears to be largely an American characteristic of modern research. This is the well-organized, well-planned, but inspired research-by-teamwork, so different from the European pattern where lingering caste concepts still tend to put the main glory and responsibility on one man. One of the obvious results of our system is that we seem to arrive at very complete results much faster."

—From a speech by Gen. J. E. Hull, Chemical Achievement Award Banquet, Bellevue-Stratford, Philadelphia, Pa.

"We speak of things being alike as two peas in a pod, but as far as accuracy goes we have passed that period many, many years ago. Not just two, but all the balls in a commercial ball bearing are the same size within .0001 inch and in precision ball bearings they are within one hundred thousandth of an inch. But luckily, we machine tool men are not satisfied with these bearings; we are continually asking to have them made to closer tolerances, and as they become ever better and finer the standard of living and the economy will become better and richer."

—By Joseph B. Armitage, vice-president of Kearney & Trecker Corp., Milwaukee, Wis.



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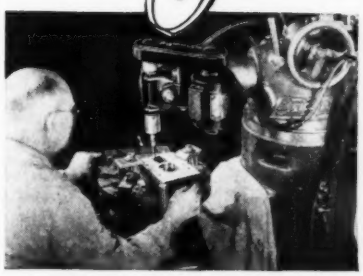
mounts on any basic machine, adapts it at low cost for wide range of grinding jobs



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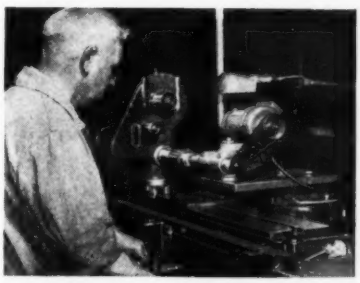
All you need is a Dumore Tool Post Grinder and some imagination to cut costly machine idle-time and avoid unprofitable "farming out" of grinding jobs in your shop. Lathes can be turned into external or internal cylindrical grinders. Planners, milling machines and shapers can become surface grinders. Special grinding and cut-off machines can be built at minimum cost.



MOUNTED ON UNIVERSAL GRINDER, Dumore Grinder finishes internal section of a Jacobs chuck.

Dumore's simplified mounting lets you make the change-over quickly — and speeds re-converting the basic machine back to its original set-up after the grinding job is done. Dumore Tool Post Grinders are rated for continuous duty at high production rates and can deliver precision to .0001" tolerances with surface finishes of 6 to 8 micro-inches. There's a complete line of nine models, 1/5 to three HP, for every size of basic machine and type of grinding job.

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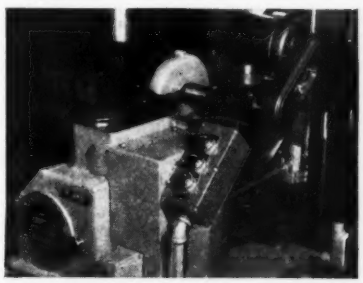
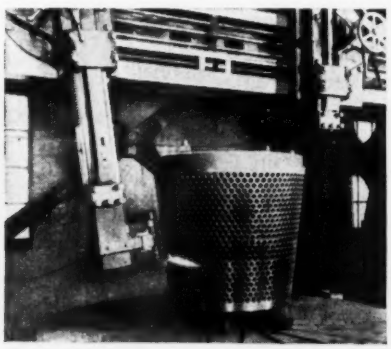


SPECIAL CUT-OFF MACHINE automatically sizes piston ring springs. Machine was made at low cost using Dumore Series 5 Grinder to carry cut-off wheel.



MOUNTED ON RAM OF A BORING MILL, a Series 12 Grinder solves the tricky problem of grinding a high finish on perforated, tapered, cast iron strainer cores.

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. . . New Concept from Page 86

as a result operator fatigue will be materially reduced.

In this type of grinding the tool does not touch the wheel and, since material is removed as a result of electrical currents rather than physical abrasion, the wheel need not be an abrasive material. This type of grinder utilizes a simple cast iron disc as a grinding electrode. It is obvious that considerable economies may be effected in wheel cost. One experiment indicates 20¢ in wheel wear is occasioned in removing one cubic inch of carbide.

Electro-spark tool sharpening offers a further advantage in that the same wheel which is used to grind the carbide can also be used to remove material from the shank which supports the tip. Consequently, it is not necessary to have different wheel materials to grind the carbide and the shank separately. This results in the elimination of one operating position in tool servicing.

We have discussed the utilization of electrical currents to remove material and have mentioned that they are used to generate forces in excess of the tensile strength of the material. Because the current flow in the machining operation is not continuous, the power drawn from the supply mains is quite small and compares favorably with the power requirements of conventional abrasive grinders which are used to perform similar operations. Sparkover-initiated discharge machines conduct current only a very small percentage of the time. The time the current is flowing in the discharge circuit, as compared with the time that current is not flowing, varies with the particular design and intent of the machining operation. In general, discharge of current into the work occupies only about 1/50th of the total operating time.

In evaluating the application of electro-spark machining, tools sharpened by the technique have been placed in the field for comparison with tools ground by more conventional methods. Field testing of carbide tipped tools serviced by the electro-spark process has been conducted on a very comprehensive basis. Results to date indicate that in all cases these tools will perform at least as well as tools finished by conventional means, and in the great majority of cases a considerable increase in performance was demonstrated.

Because the physical appearance of the machined surface is in decided contrast to what has been accepted until now as good practice, the performance factor thoroughly demonstrates a need for a new understanding of the problem. Once this performance factor has been demonstrated, an opinion can be formed as to why an electro-spark sharpened cutting tool does yield superior performance. This opinion should involve the following considerations:

1. As has previously been mentioned, the surface irregularities formed by the process give a nondirectional pattern, forcing potential fractures to seek a devious course, increasing the cross sectional area of any such fracture and resulting in a proportional increase in the stress required to bring about failure.

2. There is no possibility of damaging the carbide by the electro-spark process. The human element, which must be considered in the conventional grinding process, is eliminated, the rate of stock removal being a built-in feature of the machine itself. This rate is one which has been carefully calculated to cause no material damage through localized over-heating. Superior service performance is not due to any improvement in the carbide brought about by the process, but rather to the preservation of its original good metallurgical quality.

3. Because of the shallow nondirectional irregularities on the machined surface, the work chip and tool surfaces form an area of contact which is but a small percentage of that area on the conventional smooth tool surfaces. The result is a drastic reduction in the frictional resistance to chip flow over the face of the carbide with a resultant decrease in horsepower requirements to curl the chip. This provides for more effective use of available horsepower in performance of useful work. Another and perhaps more significant benefit derived from this phenomena is a noticeable decrease in the temperature generated at the tool and chip interface. This reduces the tendency of the chip to weld to the tool tip, the result being better surface finish on the work and less op-

Case No. 2

Operation—O.D. turning of three diameters on an SAE-4140 forged lathe spindle.
Operating Conditions:
Speed—250 sfpm
Depth of Cut—¼" average
Feed—.017 ipr
Tools—Standard brazed "AR" Style tools
Performance—Tools conventionally ground were removed for service or replacement, after producing four shafts on the average, because of severe cratering and edgewear.

With no change in operating conditions, tools sharpened by the electro-spark process permitted the production of 44 pcs before removal of the tools was necessary. It is interesting to note here that with conventionally ground tools the horsepower consumption was 15 at the start of a run, and after the four spindles had been turned the tool wear caused an increase of this factor to 17. With the electro-spark sharpened tools, the run started with a consumption of only 10 hp and at the end of the 44-pc production run only a very slight increase was recorded. Because the tooling arrangement had been established on the basis of conventionally ground tools to take advantage of nearly all the power capacity of the machine, the job was rearranged to utilize the newly available capacity. Additional tooling was added to the machine to make possible the performance of more work on the same setup.

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erating stress on the carbide tip. It is entirely possible that these conditions will permit the use of harder carbides for a given operation with still further operating economies because of reduced cratering.

A few of the many carefully documented case histories compiled during the field testing program and detailed herewith as an indication of the benefits that can be expected from this new tool servicing process.

In all the case histories extreme care was exercised to make sure that all operating conditions, tool materials, tool geometry, and work materials were duplicated.

Case No. 3

Operation—Rough facing cast iron automotive fly wheels
Operating Conditions:
Speed—260 sfpm
Depth of Cut—.020" to .030"
Feed—.037 ipr
Tools—Standard brazed "E" Style tools
Performance—Conventionally ground tools were removed from service after an average production of 300 pcs because of edgewear. Tools sharpened by the electro-spark process increased the average production per tool to 385 pcs.

It is interesting to observe that in this case, while an appreciable increase in productivity was realized, it was not as significant as in those cases where steel was the material being machined. An analysis of the situation reveals one significant factor, which may logically be accepted as an explanation for this condition. In the cast iron work, there was no continuous chip to contend with, and as a consequence, the benefits derived from reduction of chip friction are not reflected in this type of work. However, it is still possible to take advantage of the maintenance of structural strength, due to the absence of stress-raising grinding grooves and the absence of thermal checks resulting from abrasive grinding.

It has been mentioned that the metal removal rate on the electro-spark sharpening process under discussion has been predetermined at a fixed value. This value is one which is commensurate with good operating practice and compares very favorably with the rate at which tungsten carbide can be removed by grinding on conventional offhand grinders with diamond wheels.

The benefits are not derived from savings in grinding time, but rather from savings in wheel cost and in improved tool performance. As a matter of fact, it is possible to effect metal removal on carbide tools with larger silicon carbide wheels at rates somewhat in excess of that possible in the electro-spark sharpening process. However, the potential tool damage always present in these roughing operations, because of the human element, is not possible in this newly developed process.

It is anticipated that electro-spark tool sharpening will become an accepted standard practice in many of our present sharpening and servicing operations.

Torsion Bar Controls Torque on Air Tools

The torsion bar principle is applied to torque control for the first time in Ingersoll-Rand's latest air-engineering development, the Torque Control Impactool. The action of the mechanism can be likened to that of a pogo stick, which bounces evenly on soft ground, but suddenly rebounds higher when it strikes a hard surface, I-R engineers explain.

As a result, this new air-operated tool will run a nut to any desired torque with the speed of an Impactool, then automatically shut itself off. While the nut is being run to required torque the new tool operates at normal power and speed, but when required torque is reached and nut-running resistance is equal to the stress preset in the torsion bar, the impact mechanism rebounds instantly and trips a rubber-faced shutoff valve.

Torque setting is simple. It is set quickly by using a jig which turns a torsion bar and calibration collar to the desired reading against rigid splines on the torque bar adjusting sleeve.

The torque setting remains constant for any nut-running operation until the adjustment is changed. Releasing the trigger resets the tool automatically to the same torque for the next nut.

With the new tool, there is no need for pressure regulators, since it operates at full power and speed. At the same time, the tool eliminates over-torque through the automatic shutoff.

Operation is reversible with full power in either direction.

The Torque Control Impactool, manufactured by Ingersoll-Rand's Air Tool Division, 11 Broadway, New York 4, comes in two sizes. Size 5040T is especially useful in general industry, since it is relatively small and easily handled. It has two torsion bars available; the L735 torsion bar has a minimum torque of 60 ft-lbs; the H735, a minimum torque of 90 ft-lbs. The larger size 5340T is preset at 320 ft-lbs but can be easily adjusted up to a maximum of 550 ft-lbs.

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. . . Work Hardened from Page 88

ful to make them produce a slight drop-back as the tool is returned to the open position after completing its cut across the workpiece. This drop-back movement need only extend for about .005" to afford sufficient clearance between the side of the tool and the work face. Incidentally, one of the most common causes of blunt tools is the dulling induced by rubbing action as the tool trails across the machined surface on its return stroke after cutting.

It is often quite easy to remove a work-hardened surface skin by re-setting the tool so that it can be fed into the workpiece from a point behind the hardened face, using a feed movement in the direction of the face. When applying this corrective method, the tool should be fed by hand, as slowly as possible, and the speed of the work should be markedly reduced.

Another practical method comprises taking a series of cuts at 90° to the hardened surface of the work. For example, in the case of a cylindrical bar whose end has work-hardened during the facing operation, a number of cuts may be taken along the periphery of the bar to reduce the diameter for a distance of about 1/32" along the bar. Each cut to this depth will diminish the diameter of the affected hardened portion at the bar end, until the hard spot is entirely removed. This method is illustrated by Figure 2. By this method the cutting tool is applied to the hardened patch in the direction of its smallest depth, thus enabling the tool to penetrate more easily than is possible by facing across its diameter.

A further method sometimes employed by tool setters embraces use of a flat drill, of high speed steel or Stellite, formed with two opposed cutting edges which lie at a more acute angle than with a standard type twist drill. The drill is firmly fed into the slowly rotating workpiece until the hard surface layer is penetrated. A pointed lathe tool is then started within the centered recess formed by the drill point and is fed outwards to the periphery of the bar or work. After the drilling, it is better to employ a substantial depth of cut. The work should revolve at a slow speed, with plenty of coolant directed to the point of cut.

Work-Hardening Occurring in Drilling

Empiric recommendations for the speeds to be employed for drilling stainless and tough alloy steels are inadvisable, because each individual job will present its own problems, and speed of work usually has to be adjusted to suit other conditions. A good general starting basis is to use a speed ranging between half and two-thirds that normally used for plain mild steels.

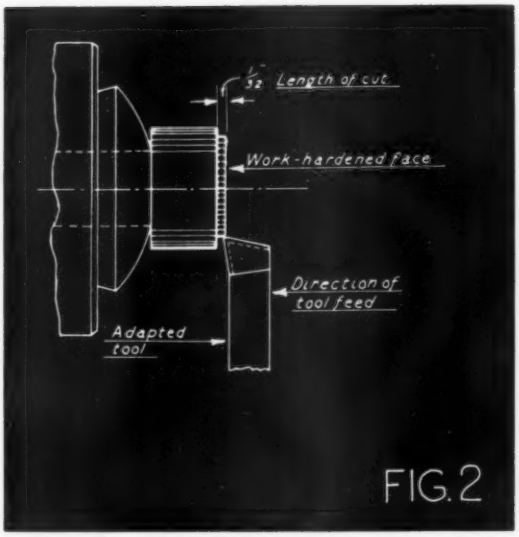

FIG. 2

Feed rates for tool traverse into the work should also generally be from 20% to 35% finer than with mild steel, but again this will depend greatly upon other factors. However, employing such initial speeds and feeds when tooling up a job in stainless steel or alloy steel, will at least assure the minimum risk of work-hardening during setting stages.

Even greater care is required with ordinary twist drills than with lathe cutting tools, if work-hardening is to be avoided, because of the flexibility of such drills. It is essential that the shortest possible drill be employed so as to ensure maximum rigidity. Grinding of the cutting edges of the drill must be accurate, preferably controlled by a precision fixture, so that cutting edges are the same length, and to the correct identical angles. The land behind each cutting edge should be smoothly honed or lapped right up to the cutting edge.

The lip at the meeting of the cutting edges should never be thinned down by grinding at the mouth of the flutes, as is common practice with drills used for cutting mild steel, because it is essential to maintain the greatest strength at the point.

Drills used for penetrating hard surface layers should have the included angle over the two cutting edges reduced from the standard 118°, to 104°-106° as shown at Figure 3, so that the drill is enabled to take up the cutting pressure in a more gradual manner and so that the hard spot on the work may be removed in finer cuts.

Standard twist drills can often be greatly improved for drilling the austenitic steels by

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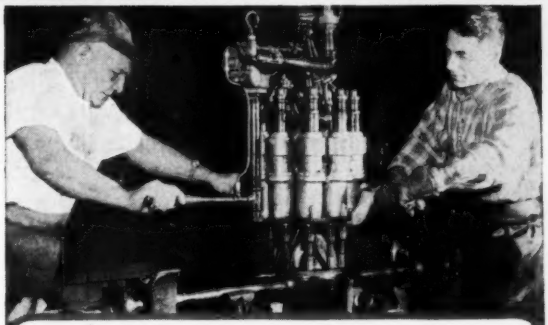
The automotive industry—and many others—are making extensive use of these tools. For detailed information contact your nearest Keller sales office. Descriptive Bulletin 16-101 sent free on request.



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making the following adaptations to their cutting edge clearance faces. The drill should be ground, in an accurate fixture, with the usual 12° clearance away from the cutting edge. Then it should be given a smaller clearance angle of about 8° to within 0.015" to 0.020" of the actual cutting edge. This modification will afford greater support and backing to the cutting edges of the drill so they will stand up more durably to the increased pressures arising when machining tough alloy steels. In the case of twist drills less than about ¼" diameter this adaptation will prove particularly helpful in safeguarding against heat generation and drill breakage.

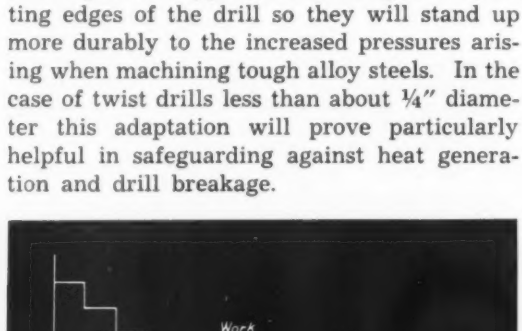

FIG.3

To minimize the development of excessive heat at the point of cut, the flute channels of all twist drills should be highly polished and maintained free from roughened spots, burrs, nicks, build-up of chips and like defects. The presence of any of the foregoing is liable to cause increased frictional resistance to the flow of chips out of the hole; thus some chips may become jammed and cause additional heat in the hole at the risk of starting work-hardening on the adjacent sides of the hole.

An ample supply of coolant should always be employed with drills and particular care must be taken in small deep hole drilling to ensure that the flow reaches the drill points. One of the functions performed by the coolant is to wash out chips and particles so that the cutting edges are kept clean and cool. To accomplish this it is frequently necessary to pump the coolant into the hole with a greater pressure than is required when drilling ordinary mild steel.

Miscellaneous Recommendations

In conclusion, mention should also be made of several other precautions which can be taken in the case of production on the automatic lathe which often help in arresting the onset of work-hardening.

Collet Sleeves

It is customary to grip round, hexagonal and square bars by means of a spring type collet sleeve. Before setting-up, the collet should be carefully examined to ensure that the split jaw portion which embraces the work has an adequate degree of spring. When the collet is open the bore of its split end should amply clear the surfaces of the alloy steel bar.

The sleeve should also be tempered to glass hardness, with its bore surface highly polished. If these points are not observed, it may be found that the bar stock tends to be rubbed while feeding through the sleeve for machining the next component. This rubbing may easily cause some work-hardening to occur on the outer surface of the bar.

Cam Wear

Before starting up regular production of stainless steel parts with automatics, the several cams employed for actuating the toolslides should be carefully inspected for absence of wear. The curved cam surfaces on which the roll followers travel should be completely free from flats, sinks, burrs or other defects.

If any of these conditions prevail, the travel of the slide may be momentarily arrested, thus allowing the cutting tool to stall for a short period during a cut. The tool is then liable to rub on the still rotating work and cause work-hardening.

All such cams should be well hardened and smoothly polished on critical bearing surfaces. Unhardened steel cams should never be used in the machining of austenitic steels. Soft cams are, of course, extensively employed for short run production in ordinary mild steel. Upon changing over a machine their unsuitability is often overlooked, thus they become the frequently unsuspected source of work-hardening troubles.

Cam Fixings

It is also essential to check all cams for being securely keyed and properly fastened to their respective driving shafts. A loose, worn, or undersize key, or a faulty fixing screw may allow the cam to dwell a slight period at a certain point in its revolution. If this stoppage of movement occurs while the tool slide is feeding the tool in the work the tool is stalled and will rub on the work, with the additional risks of causing work-hardening.

Presenting . . . Representing . . .

Cleveland Instrument Co., manufacturers of a broad line of electronic comparators and gaging equipment, has appointed two new representatives. Union Supply Co., Denver, now represents the company in New Mexico, Wyoming, and Colorado; L. W. Hodson Machinery Co., Inc., in northeastern Ohio.

Bruce Electric Co., New Castle, Pa., has been appointed as a distributor for Clark Controller Co., Cleveland. The company offers Clark Controller's complete line of pushbuttons, relays, contractors, starters, and related industrial electric control equipment.

The Taft-Peirce Manufacturing Co., has named the Acme Tool & Supply Co., San Diego, Calif., to handle the T-P standard product line of fixed gages, air gages, small tools, and magnetic chucks.

Vascoloy-Ramet Corp. has appointed three new agents for the Chicago and southern Indiana territory. All carry the complete cemented carbide line of cutting tools, Tantung, dies, and toolholders. They are: Matzen & Fortner Co., L. F. Rogers, and David W. Bristol, all of Chicago.

McBeth Machinery Co., Ardmore, Pa., has been appointed exclusive representative for the Steelweld division of The Cleveland Crane & Engineering Co., Wickliffe, Ohio.

Announcement has been made of the appointment of Edmund J. Klonowski as western New York representative for Punch Products Corp. Before forming his own sales organization, Klonowski was sales manager of Punch division of Pivot Punch and Die Corp.

Harron, Rickard and McCone Co. has been named to represent Engelberg Huller Co. in the Los Angeles area. The new dealer will carry an extensive display of Engelberg abrasive belt machines.

Adamas Carbide Corp. has appointed Todd Machinery Co. of Salt Lake City, Utah, as its exclusive agent for that area. Harry J. Todd, president of Todd Machinery, has an extensive background in the machine tool and cutting tool fields.

Roll Formed Products Co., Youngstown, Ohio, manufacturers of continuously rolled metal shapes, has appointed The Fehlenberg Co., St. Louis, to represent the firm in the central Mississippi Valley states.

UNIQUE BARTH DIE
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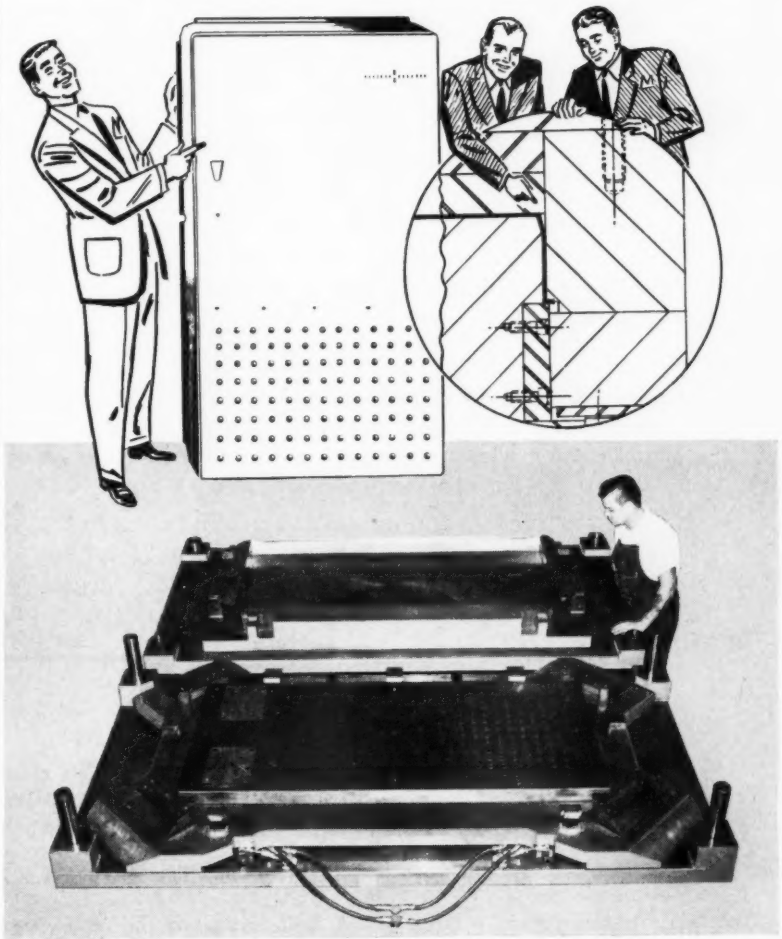
REFRIGERATOR ENGINEERS



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CIRCLE INFORM-A-GRAM KEY NO. 1411

Accuracy of Turret Slide Indexing

Tools such as center drills, twist drills and boring cutters are regularly mounted in the 6-station indexing turret slide for automatic successive presentation to the work. With old lathes the indexing movements imparted to the turret slide are often lacking in precision, with the result that tools are not located in exact axial alignment with the live spindle.

In machining the austenitic steels such misalignment is a frequent source of tool rubbing, over-heating, work-hardening, and speedy blunting or breakage of tools. If the error in the indexing of the turret slide results in the tool being presented to the work slightly above center, the clearance angles provided on the front of the tool may be so neutralized that the intended clearance between tool and work is greatly reduced, even to the point of resulting in tool rubbing.

Where a turret slide is indexed inaccurately so that the tool engages the work below the center line, the effect is to increase the clearance between tool and work, thereby allowing the actual cutting edge to lose back support. As a result of this condition, it is commonly found that the critical cutting edge speedily blunts, much heat is generated and work-hardening may accrue. The occurrence of any of these conditions with the tool, will intensify the liability toward work-hardening, for the reasons previously explained.

Coolants

Soluble oil coolant mixtures are quite satisfactory for stainless and alloy steels, providing they are not diluted with water to anything like the extent normally adopted with mixtures for cutting mild steel. The coolant should have considerable body yet should flow freely. A grade of coolant should be selected which is mixed so as to have the maximum heat absorption properties, for obvious reasons.

Rigorous attention to the foregoing practical recommendations in respect to the machining of the austenitic steels, will enable work-hardening to be kept to a minimum; and where it does unfortunately occur, to be overcome quickly and inexpensively. Thus much waste of material, labor and time can be largely avoided on all the common machining operations.

PRODUCTION UP— TOOL COSTS TUMBLE

Tool costs tumbled from 9 cents to 2 cents per piece and the production rate was nearly doubled in an eastern gear manufacturing plant as the direct result of a switch to a single grade of carbide from the several grades previously used.

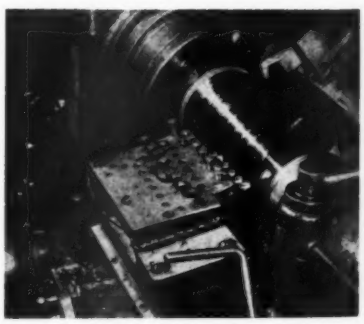
The operation consists of facing and rough turning alloy steel stem gears (32 Rockwell C) on a 20" Fay automatic lathe. Eight Wesson brazed-type flat tools and one Multicut insert holder are used in the multiple tool setup. A single carbide, Wessonmetal "26", is used on all the tools.

Formerly the job was done at 525 rpm and 270 sfpm. After the change to Grade "26", Wesson Company tool engineers recommended a boost in the production rate to 580 rpm and 305 sfpm. Even with the increased production rate, tool life has shown a marked improvement.

A 25% reduction in machining time — from 2 min/pc to 1½ min/pc — has been achieved with the present tooling. This stepped-up rate plus lower downtime for tool change due to longer tool life has increased production from 30 pcs/hr to 50 pcs/hr.

There were four sources of savings on this job: (1) The large increase in number of grinds possible per tip (9 to 10 vs. 4 formerly) due to reduced edge wear and breakage; (2) More than double the number of pieces before regrinding was required; (3) Fewer tool changes required; and (4) Higher output per hour due to increased feed and speed.

Pieces per grind with Wessonmetal "26" range from 125 to 175, compared with 60 to 70 per grind with other carbides. Normal edge wear with "26" carbide tools was only .014 after 175 pcs, with no breakage



on either tips or inserts. Thus, the number of regrinds possible per tip is considerably higher than with the carbides previously used. Total pieces per tool ranged up to 1400 for Wessonmetal "26" as against an average of 280 previously.

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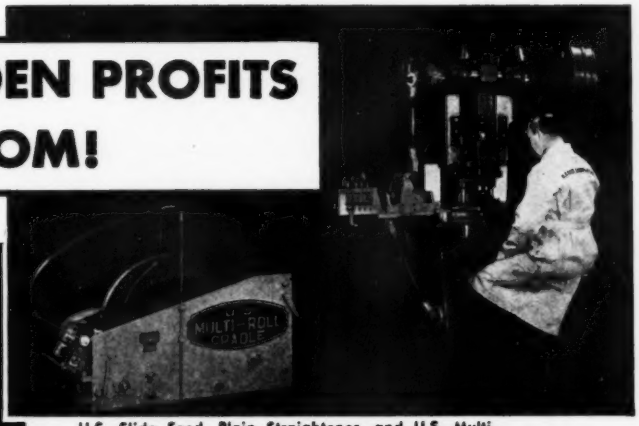
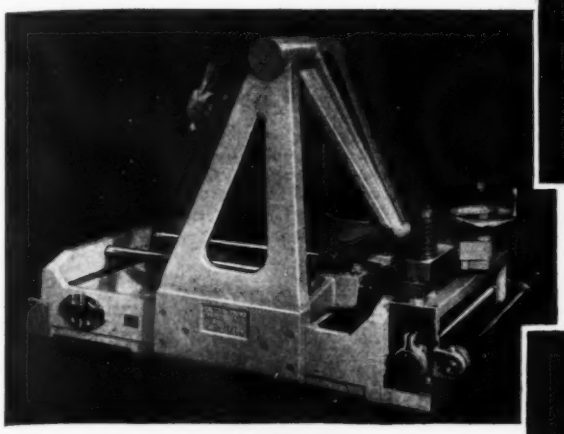
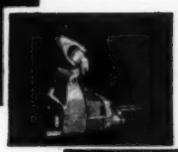


U.S. Slide Feed, Plain Straightener, and U.S. Multi-Roll Cradle used in conjunction with conventional O.B.I. Press.





Smallest and largest sizes of U.S. Slide Feeds which we now build. To the left, Model SF-24-24 capable of handling material up to 24 inches in width, with feed length adjustable up to a maximum of 24 inches. To the right, Model SF-00 capable of handling material up to 1½ inches in width with feed length adjustable up to a maximum of 1 inch.

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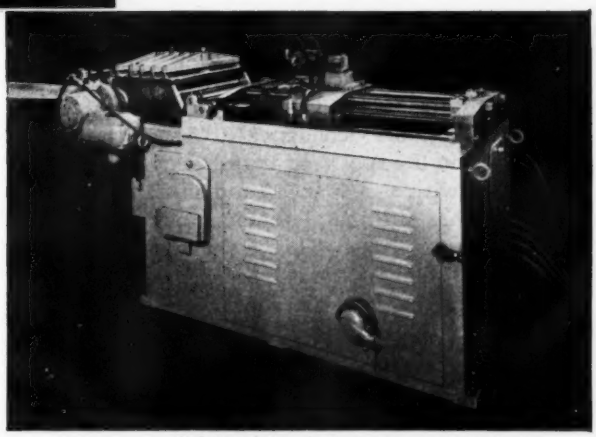

SFC-24-24 U.S. Cabinet Mounted Individually Motor Driven Slide Feed capable of handling material up to 24 inches in width, with feed length adjustable up to a maximum of 24 inches at one stroke. Equipped with Stock Straightener with a pair of Motor Driven take-in rolls suitable for material up to .060 in thickness. This feed can be cycled to obtain feed lengths over 24 inches.

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To keep pace with the requirements of stamping manufacturers, we will exhibit and demonstrate a number of completely new units in our Press Room Equipment line at the ASTE Industrial Exposition, International Amphitheatre, Chicago, Illinois, March 19-23, 1956.

Be sure to visit Booth 375 at the Exposition. In the meantime, send for our Bulletins No. 80-P and 90-P illustrating and describing U. S. Automatic Press Room Equipment.

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CIRCLE INFORM-A-GRAM KEY NO. 1431

. . . Cutting Rates from Page 84

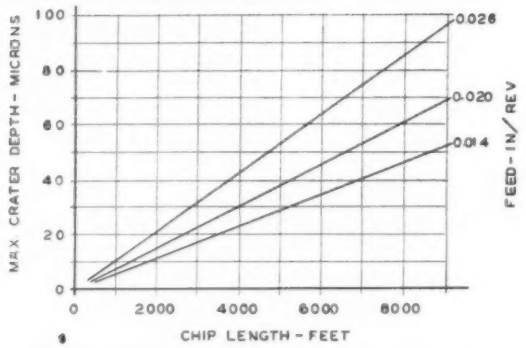


Fig. 5. Maximum crater depth as a function of the chip length at different feeds. Carbide, Coromant grade S4: depth of cut, 0.039"; speed, 197 sfpm; nose radius, 0.039".

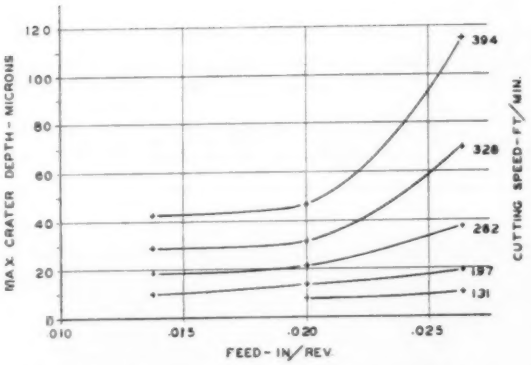


Fig. 6. Maximum crater depth as a function of the feed at different cutting speeds. Carbide, Coromant grade S4; depth of cut, 0.039"; nose radius, 0.039"; chip length, 1640 ft.

speeds, but turns and rises rapidly where normal cutting speeds are attained. One can find critical speeds which should not be passed.

The feed has the same influence on the wear as the cutting speed, see Figure 5. Increased feed increases depth of crater at a constant length of chip. However, the depth of crater is not nearly so much influenced by an increased feed as by an increased cutting speed, as indicated by Figure 6.

From the crater wear point of view, it is obviously more economical to use a medium speed and a heavy feed than the opposite way around with a high speed and small feed, provided that the metal removal per time unit remains the same. This is shown in Figure 7 where the depth of crater at constant metal removal per minute has been plotted against the feed and the speed. For example, the crater depth is 50 micron at a feed of 0.138 ipr and a cutting speed of 394 sfpm but only 12 microns at a combination of double the feed and half the speed after the same turning time of 5 min. The difference becomes still more accentuated with greater turned length or increased turning time.

How the flank wear and the top wear depend upon cutting speeds and feeds is also shown photographically in Figure 8.

The flank wear has been measured in the usual way by measuring the width of the wear land in microscope. The width of the flank wear is not a straight line function of the chip length, as disclosed by Figure 9. The wear increases during the first period with increasing chip length, but gradually the rate of wear increase becomes smaller. Figure 9 shows that the width of the wear land increases with higher speeds at constant metal removal. The feed, however, does not to any great extent in-

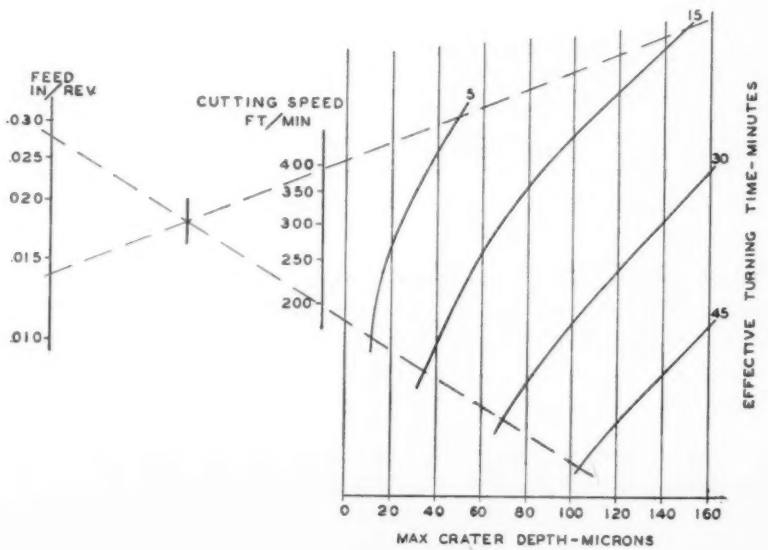


Fig. 7. Maximum crater depth as a function of feed and speed at constant chip removal per time unit. Carbide, Coromant grade 54; depth of cut, 0.039"; nose radius, 0.039".

Increased cutting speed

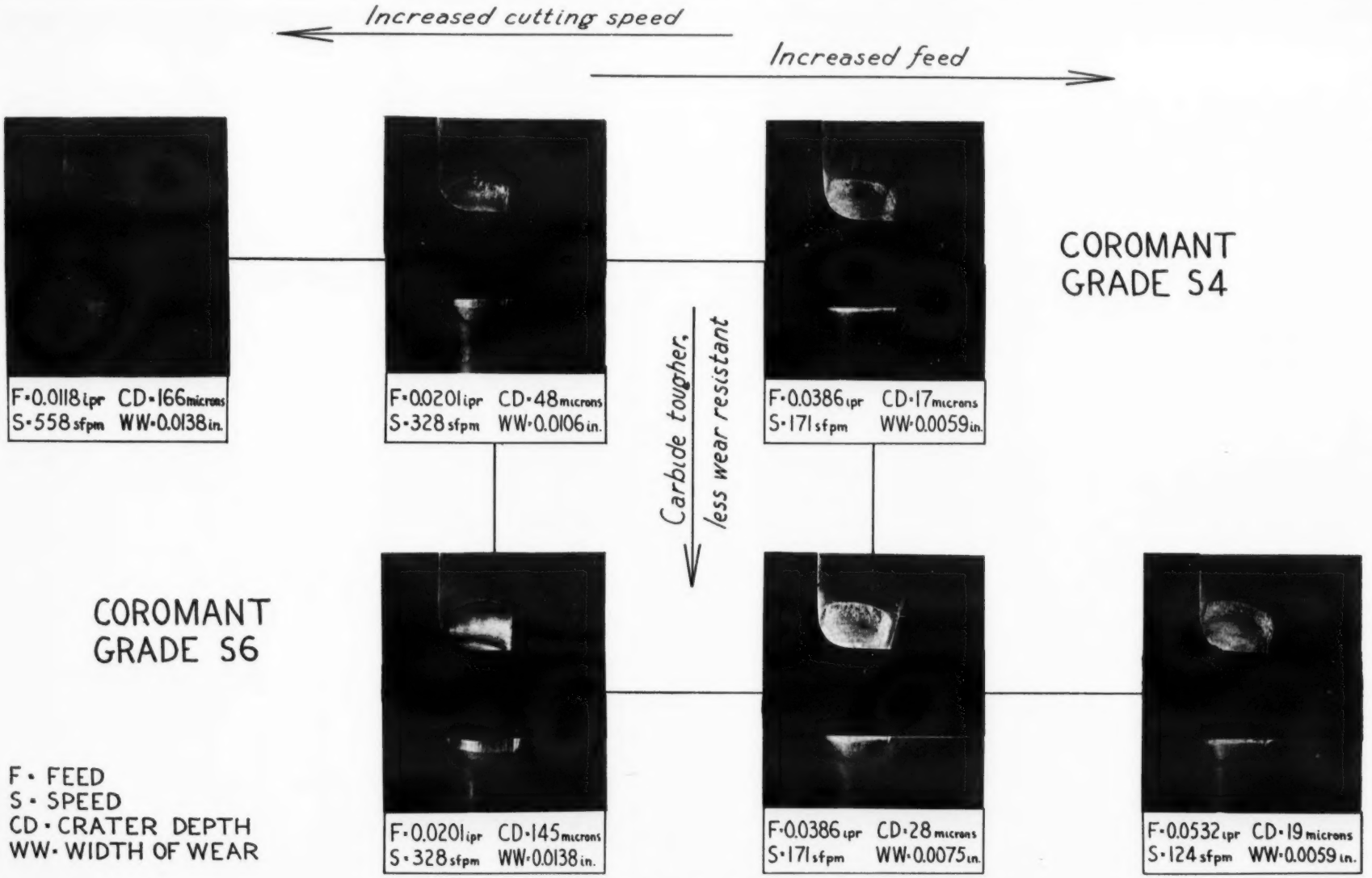


Fig. 8. Influence of cutting speed and feed on the wear picture of Coromant grades S4 and S6. The chip removal per minute and total chip removal are constant. Depth of cut, 0.039"; nose radius, 0.039"; turning time, 5 min.

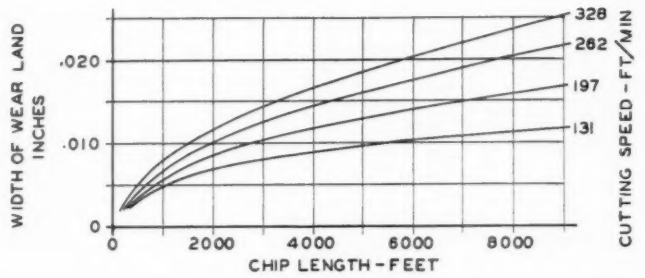


Fig. 9. Width of flank wear as a function of the chip length at various cutting speeds. Carbide, Coromant S4; speed, 0.020 ipr; depth of cut, 0.039"; nose radius, 0.039"; chip length, 1640 ft.

fluence the flank wear, Figure 10. A nomographic chart like that in Figure 7 can also be constructed of the flank wear as a function of speed and feed. From the wear pictures, Figure 8, it is evident that the flank wear basically follows the crater wear.

Conclusion

The tests have shown that an increase in feed does not increase tool wear nearly so much as the same relative increase in cutting speed. In fact, this means that a correct combination between feed and speed gives a minimum tool wear at the same production. When choosing cutting rates one should first determine the feed. The feed chosen should be as great as possible; that means as great as the stability of the workpiece, the desired surface finish, the power of the machine, etc. can allow. The grade of carbide should be able to take the load of the heavy feed. Then the feed should be adjusted according to other machining factors such as the machinability of the material and the power of the machine.

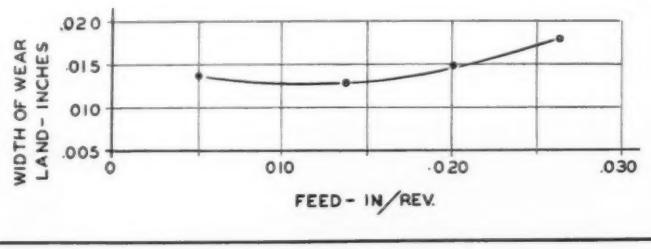


Fig. 10. Width of flank wear as a function of the feed. Carbide, Coromant grade S4; cutting speed, 328 sfpm; depth of cut, 0.039"; nose radius, 0.039"; chip length, 1640 ft.

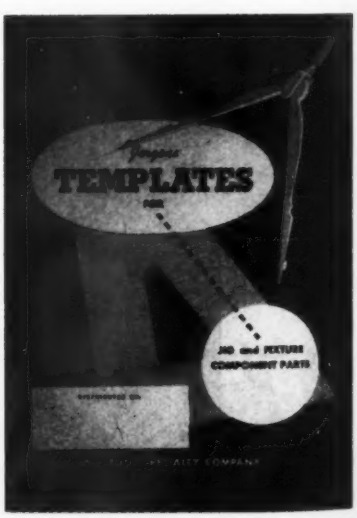
Full Size Tracing Templates for Tool Design

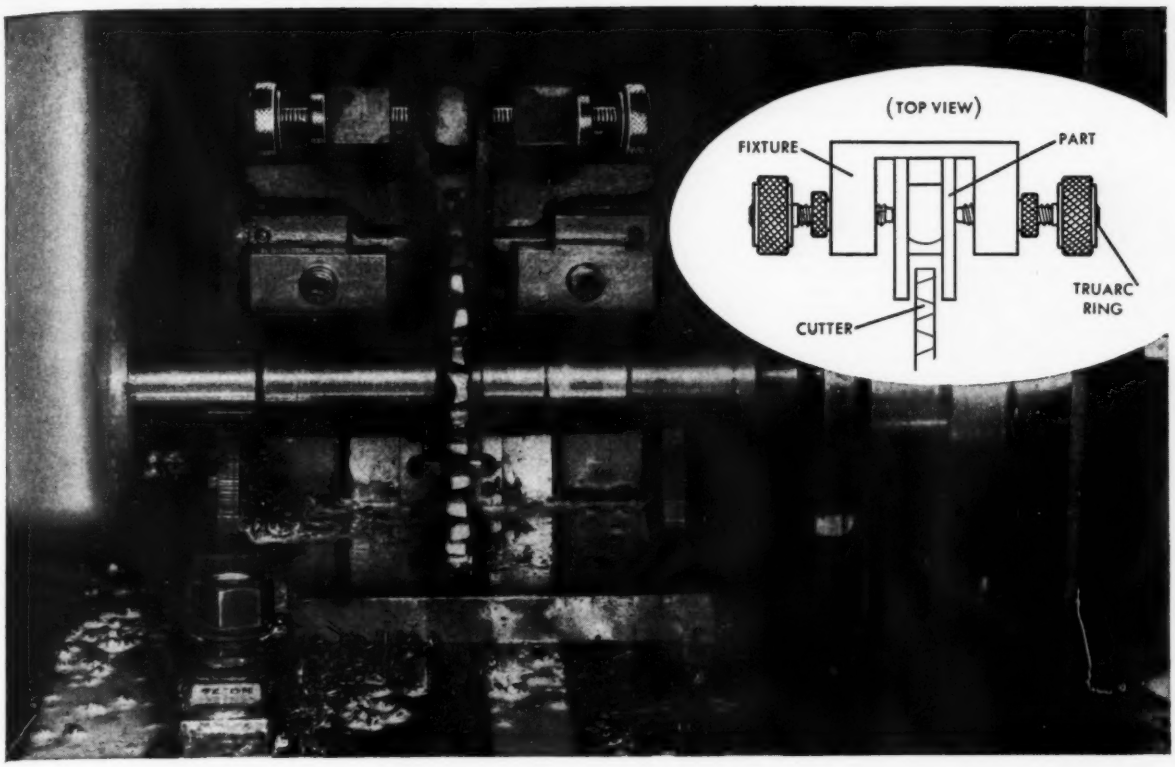
A free new portfolio containing 48 8½" x 11" tracing templates is now being offered by Jergens Tool Specialty Co.

With scale full size, the new templates are available for time and money saving tracings of all sizes of Strap Clamp Assemblies, Malleable and Aluminum Hand Knobs, Speed Handles, Speed Bar Knobs, Revolving Clamp Assemblies, and Swing Clamp Assemblies.

Printed on transparent tracing paper, the designer or draftsman need only trace the proper size component for the particular design application.

In addition the new template portfolio contains a chart giving formulas for finding functions of angles and a chart showing decimal equivalents of standard drill sizes.





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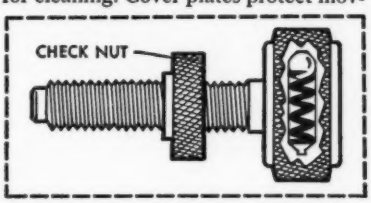
Vlier Torque Thumb Screws are simple, precision tools. They provide an accurate means of holding or supporting a part with a predetermined amount of end pressure. When used beneath or behind cutters as a positive support, they eliminate chatter, vibration and prevent deflection of the part which would result in loss of size. *Even fragile, thin-walled parts can be held securely against machining pressures without distortion.*

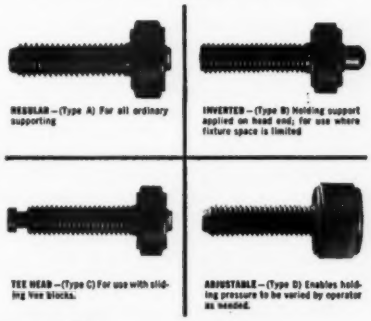
Impossible to overtighten... The head of the Vlier Torque Thumb Screw is designed with an *accurate*, spring-controlled ball-check which functions *automatically*. When the predetermined supporting pressure is reached, the head rotates freely, *preventing overtightening of the screw.* Spring pressures are determined at the factory and accuracy is guaranteed for the life of the tool. A knurled lock-nut prevents loosening of the screw due to chatter or vibration. Backing off action is positive at all times.

Built to last a lifetime... Design of Vlier Torque Thumb Screws is extremely simple. There is nothing to wear out; nothing to jam; nothing to get out of adjustment. By removing a Truarc ring the head can be taken apart for cleaning. Cover plates protect moving parts from dust, chips, etc., assuring years of profitable use. Order a supply of these money-savers from your Vlier distributor today.



In the Vlier Torque Thumb Screw spring pressure is applied perpendicular to screw axis, eliminating inaccuracies due to wobble or "slop" as wear occurs.

Available in four types; 19 models


REGULAR—(Type A) For all ordinary supporting
INVERTED—(Type B) Holding support applied on head end; for use where fixture space is limited
TEE HEAD—(Type C) For use with sliding Vee blocks.
ADJUSTABLE—(Type D) Enables holding pressure to be varied by operator as needed.

Write for your free copy of the new 1955 Vlier Catalog

Other Vlier Tooling Specialties

VLIER ENGINEERING INCORPORATED

8900 Santa Monica Blvd., Los Angeles 46, California

Stocked in Principal Industrial Areas in U. S. and Canada

CIRCLE INFORM-A-GRAM KEY NO. 1471

For Ease and Convenience Use TOOLING and PRODUCTION Inform-A-Gram Cards

Wheelabrator Steel Shot, a cast steel, heat treated, blast cleaning and peening abrasive, is described in an illustrated bulletin. Included is a tabular comparison of the characteristics of the various types of metal abrasives. In addition, the factors important to the economical and efficient consumption of abrasive are discussed. For copies of Bulletin 89-B, contact Wheelabrator Corp., 1183 S. Byrkit St., Mishawaka, Ind., or — **Circle Inform-A-Gram No. B1.**

Double Seaming Machines for medium and high speed can making lines are described in a 12-page Bliss catalog. Featured are semi-automatic round can seamers, square and irregular-shaped can seamers, automatic body feeds, semi-automatic square can seamers, and a semi-automatic side seamer. Design and construction features are given and dimensions listed. Catalog 36B, Section 5 is issued by E. W. Bliss Co., 50 Church St., New York 7, or — **Circle Inform-A-Gram No. B2.**

Compact, Efficient, and Easily Controlled are the fractional horsepower "Adjusto-Spede" drives recently added to the Dynamatic line of eddy-current equipment. They feature wide speed range, low power losses, rapid response, and accurate speed control. Further details on the drives are contained in Bulletin FAS4 from Dynamatic Div'n, Eaton Mfg. Co., Kenosha, Wis., or — **Circle Inform-A-Gram No. B3.**

"Tungsten Carbide Grades" covers straight carbide grades for machining cast iron, non-ferrous, and non-metallic materials; steel cutting carbide grades; carbide for die applications; and special purpose grades. Tables are included to serve as guides in the selection of carbide grades. For copies of the booklet, write to Dept. F-45, Adamas Carbide Corp., Kenilworth, N. J., or — **Circle Inform-A-Gram No. B4.**

An Engineering and Application Booklet describes in detail the stresses developed in various type tracks used for overhead materials handling systems. The problem of track peening and its solution is also covered. The advantages of Tramrail systems and their principal components are listed. Booklet 2008-L may be obtained from Cleveland Tramrail Div'n, The Cleveland Crane & Engineering Co., Wickliffe, O., or — **Inform-A-Gram No. B5.**

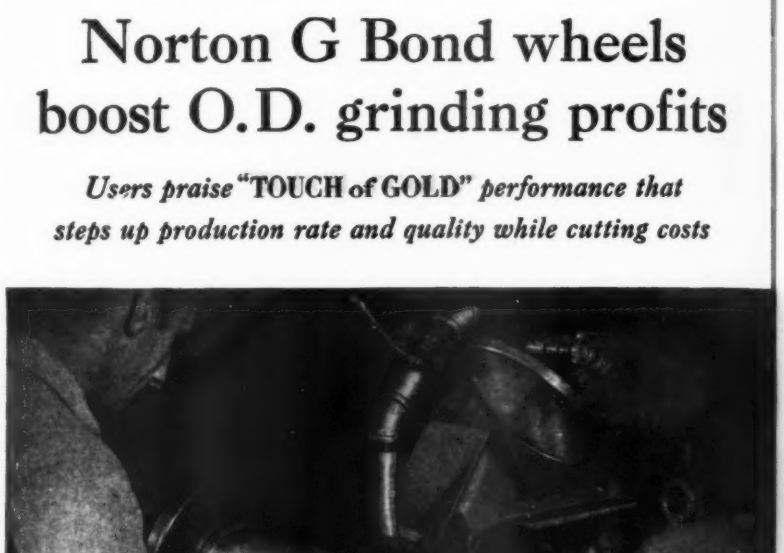
"Axelson 32" Heavy Duty Lathe" covers in detail the construction features of the machine. Each feature is pictured separately and discussed. A fold-out page presents an illustration of the lathe. Get the brochure highlighting the 32" lathe from Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, or — **Circle Inform-A-Gram No. B6.**

Precision Gaging Equipment is featured in Catalog 55L from Reliant Gage & Supply Co., 4947 Firestone Blvd., South Gate, Calif. Included are gage stand and bench centers, height gages, sine bars, dial test indicators, vernier calipers, and surface plates. Each is illustrated and described. **Circle Inform-A-Gram No. B7.**

More proof of how

Norton G Bond wheels boost O.D. grinding profits

Users praise "TOUCH of GOLD" performance that steps up production rate and quality while cutting costs



Cylindrical Grinding is faster, easier, more profitable when wheels made with the Norton G Bond — most efficient vitrified bond ever developed — add the "Touch of Gold."

Users' Reports on Cylindrical Grinding

"*G Bond wheel* gave 50% more pieces per dressing, with greatly improved finish."

"*Grinding to .001"* limits, G Bond wheels removed stock faster, more uniformly. Gave more pieces per dress, with less spark-out time."

"*Cooler cutting*, crush-trues nicely, holds form. Best wheel ever used."

"*Ground sixty .075"* radius grooves per dressing, compared to 25 with previous wheel. This G Bond wheel, also used on critical shoulder job, held form and gave superior finish."

PREVIEWS

Circle postage-free Inform-A-Gram Key Number for your request

TOOLING and PRODUCTION'S Inform-A-Gram Section is a CARDload of Information

Red Head Toggle Action Clamps are fast, economical work holding devices. They give greater production for welding, drilling, milling, grinding, etc. operations. The complete line of clamps is presented in Catalog A-55 from Case-Maul Mfg. Co., 22 Harker St., Mansfield, O., or —
Circle Inform-A-Gram No. B8.

"Heat Treated Threading Heads" covers some new die heads produced by Landis — the 4" and 6" "Lanco" heads and the 4EXX "Landmatic" head. Their features include setup ease, versatility of application, and tangential chasers. Bulletin F-90-3 is issued by Landis Machine Co., Waynesboro, Pa., or —
Circle Inform-A-Gram No. B9.

"Stainless and Heat Resisting Steels" is a schedule of extras which reflects higher finishing costs on cold finished bars and wire. Stainless steel sheet, plate, cold rolled strip, hot rolled bar and wire rod, and forgings and forged bar are covered in various sections in the publication from Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 22.
Circle Inform-A-Gram No. B10.

"The Creative Approach to Better Wiring" shows how Aircraft-Marine Products, Inc. makes available to industry a complete, detailed analysis and evaluation of a product's circuity, wiring, and termination methods. The brochure tells who can use the plan and how to put it into operation. One section is devoted to case histories complete with illustrations, and another to new developments in tooling. Aircraft-Marine Products, Inc., 2100 Paxton St., Harrisburg, Pa., or —
Circle Inform-A-Gram No. B11.

Punches, Dies, and Other Tools are highlighted in Catalog 54 from Geo. F. Marchant Co., 1420-34 S. Rockwell St., Chicago 8. The various styles and shapes of punches and dies most commonly used are illustrated. Also outlined are punches and dies with detailed dimensions. An additional supplement shows the complete range of sizes of tools stocked. **Inform-A-Gram No. B12.**

150 Silicone Products are described in the new 1956 Silicone Reference Guide published by Dow Corning Corp., Midland, Mich. They're grouped by physical form (fluids, compounds, greases, resins, rubbers) and cross-indexed by usage. Among the products discussed are release agents, lubricants, and molding compounds. The guide is illustrated with charts, tables, graphs, and application photos.
Circle Inform-A-Gram No. B13.

Streamlined Production Facilities for Roll Formed Shapes are discussed in a 26-page catalog. The processes shown include the notching, punching, and cutting to length of special shapes in one continuous operation. Some of the many simple and complex sections that are being produced are presented. Charts give the dimensions of standard round Lockseam and butted tubing. Get Catalog 1555 from Roll Formed Co., 3760 Oakwood Ave., Youngstown, O., or —
Circle Inform-A-Gram No. B14.

Users' Reports on Centerless Grinding

"*G Bond wheels* produced better form and finish than any other wheels. Gave 50% more pieces per dressing on both rough and finish grinds. Also eliminated previous distortion of work due to overheating."

"*Dressing required* only once every 4 hours, instead of every 40 minutes. Best general purpose wheel ever used on our centerless machines."

"*Cut faster and freer,* held size better and gave better finish than previous standard wheel."

"*G Bond wheel* gave 16 hours longer wheel life and produced much better finish."

Centerless Grinding benefits by the G Bond's unique ability to hold each abrasive grain just long enough for maximum cutting action — an important "Touch of Gold" advantage.

New users are quick to recognize these advantages of G Bond wheels for O.D. grinding:

Cooler cutting action . . . faster stock removal . . . better finish . . . more pieces per dressing . . . longer wheel life . . . easier dressing, with less wear on diamond or on roll.

Added up, all these advantages mean valuable production economies and improvements in your product. That's why G Bond users have been glad to show their appreciation — with a steady stream of endorsements like those shown here.

Your Norton Distributor

is ready with proof of how G Bond wheels can add the work-speeding, profit-increasing "Touch of Gold" to your own cylindrical or centerless grinding jobs. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your classified 'phone directory. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

W-1576

Making better products . . . to make other products better

NORTON

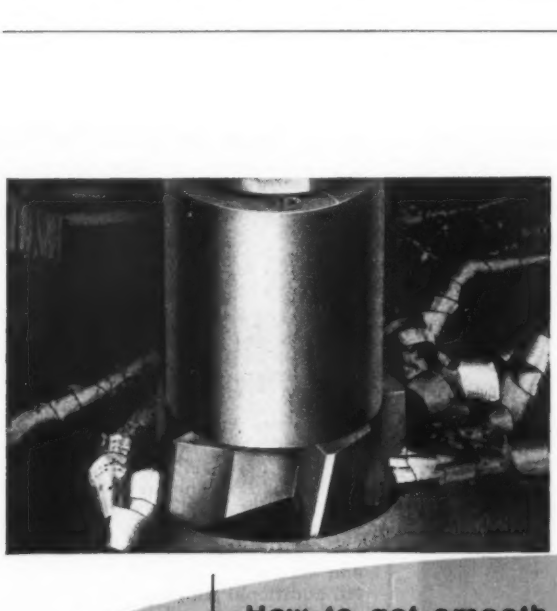
NORTON: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

CIRCLE INFORM-A-GRAM KEY NO. 1491

Hand and Hydraulic Milling Machines are the subject of Bulletin 955 from Kent-Owens Machine Co., Toledo 10, O. Each machine is illustrated and briefly described and its dimensions given. Their features which include twin post head mounting and hydraulic feeds are also described. **Inform-A-Gram No. B15.**

A Complete Line of Nylon, Phenolic, and Helical Gears in the fine pitch series 48, 64, 72, and 96 are now available from stock. In addition to these items, a new catalog covers fine pitch racks, miter gear boxes, pulleys, and vernier and dial sets. Catalog 8 which is a supplement to Catalogs 5, 6, or 7, is available from PIC Design Corp., 160 Atlantic Ave., Lynbrook, N. Y., L. I., or—**Circle Inform-A-Gram No. B16.**

"Portable Air Tools" illustrates and gives the specifications for assembly tools; drills; small wheel, straight, and vertical grinders; and scalers, chippers, and reamers. Get Bulletin 53 from The Rotor Tool Co., 26300 Lakeland Blvd., Cleveland 32, or—**Circle Inform-A-Gram No. B17.**



Counterboring a hole in a steel workpiece. Notice the chip uniformity. Here is evidence of the free-cutting action you get with Continental Counterbores. Double driving lugs on the cutters engage double abutments in the holders to give a balanced, positive drive. Notice, too, the wide cutter flutes aiding in chip disposal.

CTW

How to get smooth cutting and ruggedness with large diameter COUNTERBORES

and quick, twist of the wrist disengagement, too

Counterbore machine operators know that the real test of a counterbore drive is how it stands up under the stresses imposed during large diameter cutting operations. And operations like these have been the proving ground for Continental Counterbores. In customers' plants Continental Drives and Cutters, regardless of size have demonstrated their extreme ruggedness. An added feature to save minutes: Each Continental Counterbore Holder accommodates a wide range of cutter sizes.

And even after the toughest cuts the Continental Cutter disengages from the holder with a quick *twist of the wrist*. Because of the shape of the driving members, wedging or jamming cannot occur to delay the interchanging of cutters.

Continental Counterbore Sets are available in your choice of sizes. Each is fully described in Bulletin 60466. Write for your copy today.

Continental TOOL WORKS
Division of Ex-Cell-O Corporation
Detroit 32, Michigan

55-43

CIRCLE INFORM-A-GRAM KEY NO. 1501

Accurate Speed Control is possible with Oilgear "closed loop" hydraulic feed back drives. The bulletin, "Performance Measurements", discusses measuring techniques and presents an interpretation of frequency response and transient response data. Also considered is the nature of steady state and transient errors. The text is supplemented with numerous graphs and photos. Get Bulletin AB-6.9-1-A from The Oilgear Co., 1560 W. Pierce St., Milwaukee 4, or —
Circle Inform-A-Gram No. B18.

The Complete Line of "Allenair" cylinders, valves, clamps, and dial feed indexing tables is included in a new illustrated catalog issued by The A. K. Allen Co., 57 Meserole Ave., Brooklyn 22. Mounting diagrams and dimensions are given for each model.
Circle Inform-A-Gram No. B19.

Hydraulic Presses are the subject of a Clearing Machine catalog. The presses are discussed in terms of size, capacity, feeding, controls, speed, flexibility of use, and integration with existing equipment. Their various features are also shown and explained. The entire line is illustrated and described, including sections on special presses and auxiliary equipment. Get Bulletin 231 from Clearing Machine Corp., Div'n of U. S. Industries, Inc., 6499 W. 65th St., Chicago 38, or —
Circle Inform-A-Gram No. B20.

Unbreakable Thread Broaches are the subject of a circular from Shearcut Tool Co., 7045 Darby Ave., Reseda, Calif. They produce perfect holes without binding or seizing in the hole and require less than half the power needed for tapping. The circular also gives instructions for use, resharpening, and ordering, and a table of fractional sizes.
Circle Inform-A-Gram No. B21.

A Stationary Automatic Painting Machine is featured in Brochure 601 from Conforming Matrix Corp., 416 Factories Bldg., Toledo 2. Model PC1S is designed for single color decorating of small and medium size parts. It is a self-contained, completely enclosed, air operated machine. **Inform-A-Gram No. B22.**

Greater Accuracy, Heavier Cutting, and increased rigidity are incorporated into the new Cincinnati rigid shapers. They range in capacity from 16" to 36" and are built with either plain or universal tables. Complete details on the shapers are found in a bulletin from The Cincinnati Shaper Co., Cincinnati 25, or **Circle Inform-A-Gram No. B23.**

X-Ray and Gamma Ray Protective Equipment and materials for industrial uses of X-ray and radioisotope devices are the subjects of a new brochure. The materials and equipment are illustrated and discussed, and construction features pointed out. The brochure, "X-Ray Protective Materials", is available from Ameray Corp., 45 Route 46, Kenvil, N. J., or —
Circle Inform-A-Gram No. B24.

Mandrel Sets for toolrooms are highlighted in a Sunnen brochure. These sets contain assembled honing units in popular sizes, ready to use. The correct size is right at hand for fitting dowel pins, punches, ejector pins, drill bushings, ring gages, etc. requiring smooth, precise hole diameters between 0.120" and 2.625". Sunnen Products Co., 7910 Manchester Ave., St. Louis 17, Mo., or —
Circle Inform-A-Gram No. B25.

"Versatility . . . The Story of the Newest Basic Machine Tool" details the use of the DoAll "Contourmatic" band machine. It is based on the machine's ability to cut directly to a layout line, remove unwanted metal in whole sections, and cut continuously. The last pages of the folder show parts now band machined that were formerly machined by other methods. For a copy of the folder, contact The DoAll Co., Des Plaines, Ill., or —
Circle Inform-A-Gram No. B26.

Boring Bars, Cutters, and Blocks are featured in General Catalog BT55 from Lehman Boring Tool Div'n, Fulton Iron Works Co., 4389 Duncan Ave., St. Louis 10. They're discussed and illustrated complete with specifications. One section is devoted to case histories. Also presented is grinding data and typical shank dimensions.
Circle Inform-A-Gram No. B27.

Precision Roll Feed Control is possible with the Peterson "Select-o-matic" universal ratchet indexer. It features multiple pawl ratchet drive and automatic pawl selection, positive engagement, and high torque rating. A bulletin from Carl G. Peterson Co., 9 Warren Ave., E. Providence, R. I., gives more information on the indexer, or —
Circle Inform-A-Gram No. B28.

Flowmeters, Models "L" and "LP", are featured in a bulletin from the Instrument Div'n, Scully-Jones and Co., 1901 S. Rockwell St., Chicago 8. They're designed with a flexible vane traveling under flow to indicate flow on a calibrated scale. Model "LP" has a transparent cover to permit viewing the liquid or gas flow. **Circle Inform-A-Gram No. B29.**

A Grinding Machine Leasing Program has been developed by Norton. Three plans have been set up to facilitate the purchase of grinders and lappers on extended terms. Full details on the program are found in a bulletin which may be requested from Norton Co., Worcester 6, Mass., or —
Circle Inform-A-Gram No. B30.

A Condensed Engineering Catalog presents flexible all-metal couplings for mechanical power transmission. It tells how to select a flexible coupling and discusses the advantages of Thomas couplings. General dimensions, diagrams, application illustrations, and descriptions of each type are included. Thomas Flexible Coupling Co., Warren, Pa., will send copies of Catalog 51-A, or —
Circle Inform-A-Gram No. B31.

Automatic Indexing is a feature of the Pratt & Whitney 42" precision plain rotary table. It automatically positions work to any desired angle by means of easily set dogs. Details on the table are found in Circular 594 issued by Pratt & Whitney Co., Inc., W. Hartford 1, Conn., or—**Circle Inform-A-Gram No. B32.**

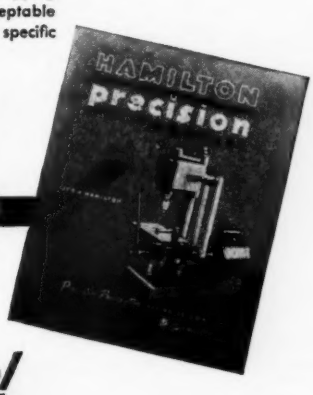
5203-2

IT'S A HAMILTON

INDEED

There is no way under the sun to do small, precision tapping with "production" speed, satisfactory tap life and acceptable accuracy, other than to use a tool designed for the specific purpose.

THE *Hamilton* SUPER-SENSITIVE SMALL HOLE TAPPING MACHINE IS SUCH A TOOL!



WANT ALL THE FACTS ?

Write for Hamilton Bulletin No. 5203. Address The Hamilton Tool Company, 832 South Ninth Street, Hamilton, Ohio.

IT'S A Hamilton Tool
USE IT WITH CONFIDENCE

CIRCLE INFORM-A-GRAM KEY NO. 1511

Specifications of the 5 "Burgmaster" turret drill models are found in a new bulletin. Information is also given on the Burg "Tool-flex" line of full floating tool holders. These drills do the work of up to 8 machines with only 1 operator. Burg Tool Mfg. Co., Inc., 15001 S. Figueroa St., Gardena, Calif., or —
Circle Inform-A-Gram No. B33.

"Management Guide to the Use of Forgings" states the advantages forgings offer to the designer, the metallurgist, the purchasing agent, and executive management. An explanation of a closed die forging is presented. In addition, the booklet points out why, when, and where forgings can be of value. Copies of the booklet may be had by writing to the Drop Forging Association, 419 S. Walnut St., Lansing 33, Mich., or — **Circle Inform-A-Gram No. B34.**

Typical Results of Tocco induction brazing and soldering are shown in Catalog 22, Section E, from Tocco Div'n, The Ohio Crankshaft Co., Cleveland 1. The literature presents seven case studies showing actual applications.
Circle Inform-A-Gram No. B35.

Want to Save Money in YOUR Tool Room?

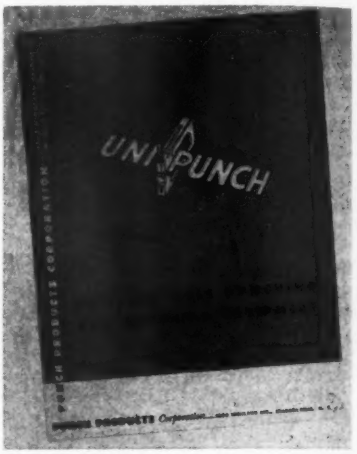
THEN get a handy NORBIDE® Dressing Stick from your local Norton distributor. You'll find it's just the thing for cleaning up a wheel face, forming a radius or touching up a tool wheel in a jiffy!
You'll find too that with one of these light, easy-to-grip sticks you can see more of the wheel face and avoid costly overdressing. And it will greatly reduce dust nuisance too.
Better yet, a NORBIDE Stick of Boron Carbide — the hardest man-made material commercially available — will outlast hundreds of ordinary sticks.
Order one today or write for Form 1567 giving more details.

NORTON COMPANY
47 New Bond St., Worcester 6, Mass.

NORTON BORON CARBIDE
Next to the diamond in hardness — available at a fraction of diamond cost
CIRCLE INFORM-A-GRAM KEY NO. 1521

Hydraulic Gap Presses are detailed in Catalog A-1 from A. B. Farquhar Div'n, The Oliver Corp., Hydraulic Press Dept., York, Pa. Their features are pointed out and briefly discussed. A diagram and table present their specifications. One page deals with fixtures and accessories and another illustrates the gap presses that are available.
Circle Inform-A-Gram No. B36.

"Unipunch" Perforating Units are described in a new catalog recently released by Punch Products Corp., 3800 Highland Ave., Niagara Falls. Series A units for press and press brake setups punch round or shaped holes in sheets or angles up to ¼" thick. Series B punch round and shaped holes in metal up to ⅛" thick and are designed for presses with small strokes. Featured are the 2-piece punches. The last section of this Unitized Tooling Catalog contains engineering data.
Circle Inform-A-Gram No. B37.

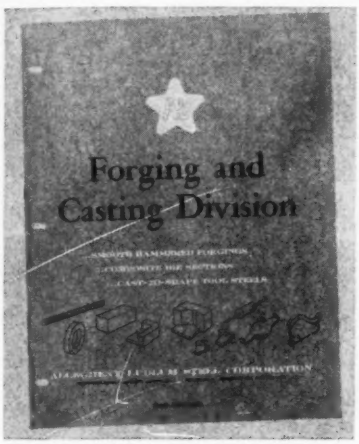


Improve Production, Control Quality, and Protect Machines with Metron stationary tachometers. They have new circuits and takeoff heads that increase the life of the tachometers by 5 times. Bulletin 105 listing their features and showing typical applications is supplied by Metron Instrument Co., 432 Lincoln St., Denver 3, Colo., or —
Circle Inform-A-Gram No. B38.

"Cold Rolled Specialty Steels" gives a description of Crucible Steel's Spaulding Mill, its capacity, and its products. The section on untempered spring steel covers bend tests and describes edges and finishes. The one on hardened and tempered spring steel shows tempering furnace layout and discusses finish, and testing and hardness. Also included are coil weight formulae, a hardness conversion table, and thickness gage numbers. Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, or —
Circle Inform-A-Gram No. B39.

Autofeed Presses for high-speed production stamping with progressive dies are described and illustrated in a new Danly catalog. Their capacities range from 50 to 800 tons. The catalog discusses how stampings can be turned out at a higher rate/hr and how to get the best efficiency out of costly progressive dies. A cut-away chart explains the automatic lubrication system and oil pressure safety switch. "Series H Catalog" is made available by Danly Machine Specialties, Inc., 2100 S. Laramie Ave., Chicago 50, or — **Circle Inform-A-Gram No. B40.**

Smooth Hammered Forgings, composite die sections, and cast-to-shape tool steels are discussed in "Forging and Casting Division", 2nd edition, released by Allegheny Ludlum Steel Corp., Forging and Casting



Div'n, Ferndale, Detroit 20. Their properties and treatments, and the special forms and the finishes in which they are made are presented. Detailed diagrams of the various shapes are also given.
Circle Inform-A-Gram No. B41.

A New Drill Catalog serves as a guide to evaluating and improving automatic drilling and lapping setups. It covers Dumore automatic drilling and tapping units and accessories, listing their features and advantages. Also shown are applications of typical Dumore installations. Catalog 55-D may be obtained by contacting Dumore Precision Tools, 1300 — 17th St., Racine, Wis., or — **Inform-A-Gram No. B42.**

"Friction Sawing" tells how to save time in machining straight and contoured parts from plate materials. The booklet explains in detail this relatively new method of sawing. Among the topics covered are useful frictional heat, friction cutting by band saw, and cutting plastics. Also included are illustrations of the saws produced by The Tannewitz Works, Grand Rapids, Mich.
Circle Inform-A-Gram No. B43.

Strength, Long Life, and Faster Cutting are some of the features of "Micro Miniature" end mills. They will perform operations requiring small end mills such as milling, engraving, routing, and profiling. A booklet presents the line of "Micro Miniature" end mills produced by Woodson Tool Co., 4811 W. Lennox Blvd., Inglewood 2, Calif.
Circle Inform-A-Gram No. B44.

The "Duplimatic" is a tracer attachment for low cost contour machining of dies. It is also used for production work from originals, models, and templates. Model 180 is for single feed control, Model 360 for dual, and Model 540 for triple. Read all about them in a catalog from Tracer Control Co., P.O. Box Q, 595 E. Ten Mile Rd., Hazel Park, Mich., or —
Circle Inform-A-Gram No. B45.

Dial Indicators are the subject of Catalog 55 released by Federal Products Corp., 1144 Eddy St., Providence 1, R. I. Each model is illustrated and described, and its features pointed out. The catalog also gives specifications and selection and ordering information.
Circle Inform-A-Gram No. B46.

5419

PRECISION GEARS

YOU who use small gears, (to 6" O.D. of the gear blank) can improve the performance of your product, through increased gear precision, without sacrifice of gear production.

YOU who use small, fine pitch, precision gears can increase your gear production without sacrifice of gear accuracy, or improve your gear accuracy without sacrifice of gear production.

The Hamilton Precision Gear Hobber, the hobber with a "reserve of accuracy," regularly holds work spindle and hob spindle runout to less than .0002", workspindle and tailstock spindle alignment to less than .0002", and this workmanship is maintained throughout the machine.

WANT FACTS?
Write for Bulletin No. 5419.
Address The Hamilton Tool Company
832 South Ninth Street,
Hamilton, Ohio.

IT'S A Hamilton Tool
USE IT WITH CONFIDENCE

CIRCLE INFORM-A-GRAM KEY NO. 1531

Grind Holes, round, straight, and to size within 0.0001" with the No. 2 E vertical precision hole grinder. This grinder has a wide range of grinding speeds from 4000 to 100,000 rpm. For further information on the No. 2 E grinder and its features, get Circular 589 from Pratt & Whitney Co., Inc., W. Hartford 1, Conn., or — **Circle Inform-A-Gram No. B47.**

"Coverlac" SC224 is a new plastic strippable film that gives complete protection from scratches, rust, oils, acids, etc. It protects metal surfaces during blanking, drilling, routing, form rolling, riveting, and shipping. This coating may be peeled off with no need to shine or clean the surface beneath. Get Bulletin M-2 from Spraylat Corp., 1 Park Ave., New York 16, or — **Circle Inform-A-Gram No. B48.**

Accurate Adjustment and secure locking are features of the "Tru-Hole" micrometer-adjustable boring bar insert. A bulletin presents suggested mounting arrangements and a table giving insert data and boring range. E. F. Vilter Co., 4161 N. Richards St., Milwaukee 12, will furnish copies of the bulletin, or — **Circle Inform-A-Gram No. B49.**

ABC FAST SERVICE

YES SIR!

We specialize in *FAST* service when you need it.

Your orders are handled *FAST* at *ACCURATE.*

IMMEDIATE SHIPMENT

from huge inventory at our factory . . .

or from large stocks located in your area.

Special Sizes are given extra attention to be sure you get FAST service.

The next time you need drill bushings . . . *try ACCURATE!* You'll be pleased!

Write for New Price List — designed for quick, accurate reference

ACCURATE BUSHING COMPANY

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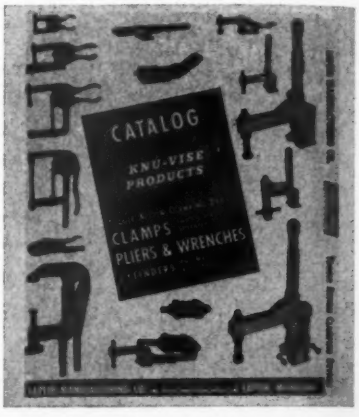
CIRCLE INFORM-A-GRAM KEY NO. 1541

Accurate Dimensions, flatness, precision, and parallelism are assured with DoAll manual and automatic surface grinders. Among the grinders described in a new 24-page catalog are Models D6, D8, and D10. Also explained is how the combination "cool grinding" and flood coolant attachment reduces grinding heat. In addition, numerous optional accessories and features for extending the application of surface grinders and improving efficiency and speeding operations are included. The catalog "Precision Surface Grinders", is supplied by The DoAll Co., Des Plaines, Ill., or — **Circle Inform-A-Gram No. B50.**

"Knu-Vise" Toggle-Action Clamps, pliers, and wrenches are detailed in a 70-page catalog released by Lapeer Mfg. Co., 1144 W. Baltimore, Detroit 2. The catalog contains pictures, template drawings, and complete descriptions of all hand and air-operated clamping devices produced by the company. **Circle Inform-A-Gram No. B51.**



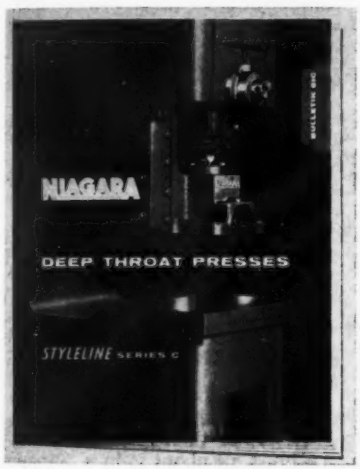
"Hydraulic Presses for the Metalworking Industry" shows presses for bending, cogging, flanging, forging, forming, straightening, and upsetting operations. Each press is illustrated and its specifications listed. Copies of the brochure may be obtained by writing to The R. D. Wood Co., Public Ledger Bldg., Philadelphia 5, or — **Circle Inform-A-Gram No. B52.**

Completely Interchangeable Mountings are featured on Petch heavy duty air cylinders. These cylinders can be adapted to automation, die work, and automation conveyor applications; foundry, press, and welding equipment; and machine tools and fixtures. Engineering drawings are included on all 5 interchangeable mountings — foot, clevis, trunnion blind end flange, and rod end flange. For complete details, get the Heavy Duty Air Cylinder Catalog from Petch Mfg. Co., 463 York, Detroit 2, or — **Circle Inform-A-Gram No. B53.**

"Hand Forgings". This folder charts the comparative minimum mechanical property guarantees for Kaiser aluminum hand forgings. It tabulates tensile and yield strengths and elongated percentages of hand forgings made from aluminum alloys 2014-T6 and 7075-T5 in sizes up to 2000 lbs. Kaiser Aluminum & Chemical Corp., Industrial Service Div'n — PR 355, 1924 Broadway, Oakland, Calif., or —
Circle Inform-A-Gram No. B54.

How Quick Setups and Easy Change-Overs Are Made to permit a wide variety of boring, turning, and facing operations on standard precision boring machines, is pictured in an Ex-Cell-O bulletin. The emphasis is on a universal fixture which is made in 2 sizes. Further details are in Bulletin 31255 made available by Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, or —
Circle Inform-A-Gram No. B55.

Series C Deep Throat Presses are introduced in a new Niagara bulletin. Descriptions and specifications are given for the complete range of the 22 to 150-ton capacity presses. They feature a front-to-back crankshaft design, automatic lubrication,



and enclosed driving mechanism. Other press features are shown and discussed in the 56-page bulletin. Requests for Bulletin 61C should be sent to Niagara Machine & Tool Works, 683 Northland Ave., Buffalo 11, or — **Inform-A-Gram No. B56.**

Dimensions, Capacities, construction, and performance curves are given for the Leiman line of rotary air and vacuum pumps in a new catalog. Included are 4-wing, 2-wing, and double-cylinder types; motor driven models; integral pump and motor; air motors; and accessories. Leiman Bros., 102 Christie St., Newark 5, N. J., will supply Catalog 755, or — **Circle Inform-A-Gram No. B57.**

Eyesavers are highlighted in Bulletin 200 from Watchemoket Optical Co., Inc., Providence 3, R. I. Many different types of glasses and goggles that provide adequate, safe eye protection are covered. Each is illustrated and described and the safety features pointed out.
Circle Inform-A-Gram No. B58.

Thirty Adhesive Formulations for bonding plastics and metals to themselves and to each other are covered in a new data chart. It lists technical data, form, percentage solids, average viscosity, fastest optimum curing time, lowest optimum curing temperature, and application suggestions. The concise easy-to-read chart may be obtained by writing to Dept. P, Rubber & Asbestos Corp., 225 Belleville Ave., Bloomfield, N. J., or —
Circle Inform-A-Gram No. B59.

Drafting Templates are featured in a catalog from A. Lawrence Karp, 16 Putnam Park, Greenwich, Conn. Included are new tool design and structural cross sections drafting templates. Each of the many plastic templates is described and illustrated. **Inform-A-Gram No. B60.**

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ONE MAN CREW
WITH PORTELVATOR®
THE HANDY HAMILTON PORTABLE ELEVATING TABLE

One man can lift, lower, and transport compact, heavy loads which, without Portelvator, would require the combined strength of three or more men.

Maintains materials at proper machine feeding level.

Speeds transfer of tools, dies, and fixtures between machine and storage.

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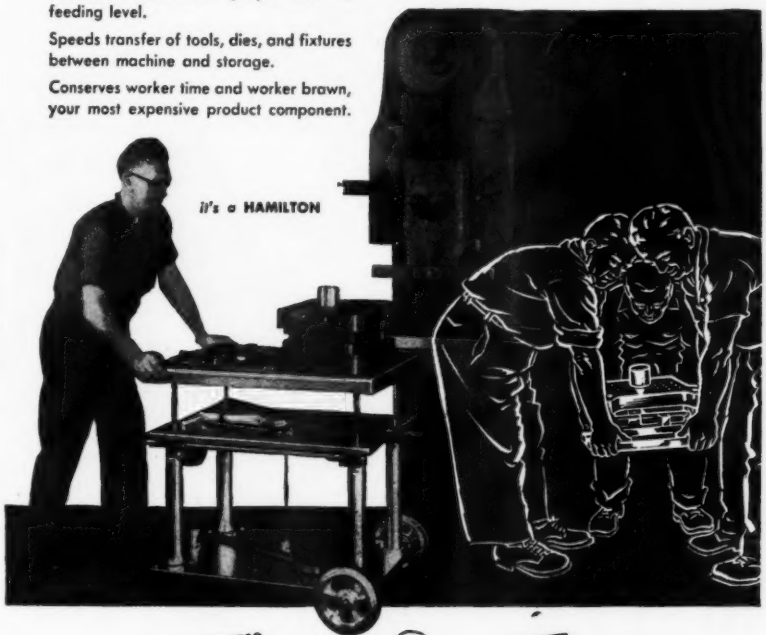
Provides a portable work bench when and where required.



WANT MORE FACTS?
Write for FREE Hamilton Bulletin No. 5346.
Address The Hamilton Tool Company,
832 South Ninth Street, Hamilton, Ohio

IT'S A Hamilton Tool
USE IT WITH CONFIDENCE

CIRCLE INFORM-A-GRAM KEY NO. 1551

Deburr, Smooth, and Polish Hard or Soft Metals, etc. with "Cratex" rubberized abrasives. Their applications are shown and discussed in detail in a data sheet from Cratex Mfg. Co., 81 Natoma St., San Francisco 5, or — **Circle No. B61.**

Nicrobraz Paste, a stainless brazing alloy in paste form, is described in a 3-page engineering data sheet. Some of the best recommended brazing applications are outlined. Application procedure is explained as well as methods for removing flux and separating joints which have been brazed with the paste. Data Sheet 12 is supplied by Stainless Processing Div'n, Wall Colmonoy Corp., 19345 John R St., Detroit 3, or — **Circle Inform-A-Gram No. B62.**

A Fully Automatic Screw Machine is the Cleveland Model AB 1⅜" and 1⅝" single spindle "Dialmatic". With this machine there are no spindle gears or turret cams to change. Its specifications and features are found in a bulletin from The Cleveland Automatic Machine Co., Cincinnati 12, or — **Circle Inform-A-Gram No. B63.**

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CROBLOX are made of solid chrome carbide, unbelievably hard, extremely resistant to corrosion, with thermal variation similar to steel.

During the many years in which CROBLOX have been in service, none, as far as we know, have failed to justify all claims.

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LARGEST EXCLUSIVE MANUFACTURER OF PRECISION GAGE BLOCKS

CIRCLE INFORM-A-GRAM KEY NO. 1561

A 4-Column "Hy-Power" Hydraulic Press is used for trimming, compression type molding, and sheet metal forming. It features a pressurized stroke so that there is never a lag of power. Its features and typical applications are given in a circular issued by Paul Machine Tool & Die Works, Machine Tool Div'n, 4600 S. Kedzie Ave., Chicago 32, or — **Inform-A-Gram No. B64.**

Data on Carbide Tipped Tools is found in a new 12-page catalog. It contains charts, illustrations, and descriptions of the various types, sizes, and styles of standard and special carbide tipped tools. Also presented are illustrations of their proper application. Copies of Catalog 850C are provided by Besly-Metro Div'n, Besly-Welles Corp., Beloit, Wis., or **Circle Inform-A-Gram No. B65.**

Cut Part Costs by using a high strength, free machining steel bar which requires no heat treating. "Fatigue Proof" steel bar replaces both heat treated, hot rolled or cold finished steels in various carbon or alloy grades. It machines 25% faster than annealed alloys and 50% to 100% faster than heat treated alloys. Read all about it in a 20-page brochure, "Fatigue-Proof", from LaSalle Steel Co., Hammond, Ind., or— **Circle Inform-A-Gram No. B66.**

"Isolant", a complete line of vibration control material, is discussed and illustrated in a T. R. Finn catalog. It is recommended for massive, difficult to ilsolate machinery. "Isolant" is made up of millions of hermetically-sealed minute air cells that expand or contract according to the applied load. Detailed descriptions of typical installations and proper methods of installation are given in Catalog IS-55 from T. R. Finn & Co., Inc., Industrial Div'n, 200 Central Ave., Hawthorne, N. J., or — **Circle Inform-A-Gram No. B67.**

Lower Finishing Costs are possible using "Hydro-Finish" cabinets. This liquid blast cleaning is used to remove heat treat scale and discoloration, to remove and blend directional grinding lines, for die and mold maintenance, etc. A bulletin giving details on the cabinets and process presents comparison photos of maintenance cleaning. Diagrams show dimensions, sizes, and features of the cabinets. Pangborn Corp., Hagerstown, Md., will supply copies of Bulletin 1403, or — **Circle No. B68.**

Precision Equipment for the tool and machine industries is covered in a 20-page Challenge catalog. Among the subjects described and illustrated are angle and bench plates, bench blocks, checking tables, straight edges, surface plates, and V-blocks. Catalog 838 is made available by The Challenge Machinery Co., Grand Haven, Mich., or — **Circle Inform-A-Gram No. B69.**

Edlund 4F Drilling and Tapping Machine is highlighted in a new bulletin. Its advance desig· features include infinitely variable speeds to 2000 rpm and extra heavy ribbed

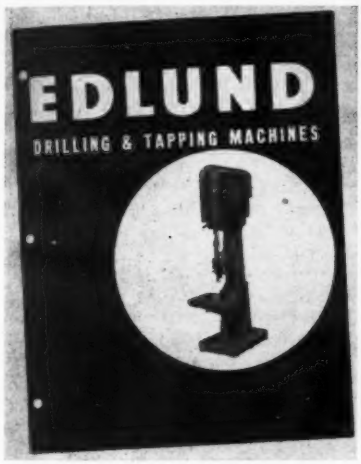

table and pedestal for long run production rigidity and accuracy. Request Bulletin 170 from Edlund Machinery Co., Cortland, N. Y., or — **Circle Inform-A-Gram No. B 70.**

Adaptability and Versatility of Design are shown in a new vibration mountings catalog. A chart for determining the minimum deflection required for a selected vibration isolation efficiency is shown on the cover. Spring-flex and pad-type mountings are pictured and described. Illustrations of typical installations where the mountings have solved specific vibration problems are also included. Copies of Catalog G-55 may be obtained from Vibration Mountings, Inc., 76-17 Queens Blvd., Elmhurst, N. Y., or — **Circle Inform-A-Gram No. B71.**

More Economical Parts Production is possible with alloy mechanical steel tubing. The advantages gained by using mechanical tubing are discussed in a new bulletin. Read all about it in Bulletin TB-360 which is supplied by Tubular Products Div'n, The Babcock & Wilcox Co., Beaver Falls, Pa., or — **Circle Inform-A-Gram No. B72.**

"Gages". This catalog presents the complete line produced by Pipe Machinery. It is divided into sections which cover special, titanium, cylindrical, thread plug, thread ring, pipe, and oil and A.P.I. gages. The last section has various tables giving pitch diameter tolerances, thread values, etc. Get copies of Catalog 10 from The Pipe Machinery Co., Wickliffe, O., or — **Circle No. B73.**

Applications of "Flexaust" Flexible Hose in the metalworking industries are covered in Bulletin 50 from The Flexaust Co., 100 Park Ave., New York 17. "Flexaust" hose and "Portovent" duct can be used for dust and fume control, ventilation, and suction and pressure applications. **Inform-A-Gram No. B74.**

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3P
IMMEDIATE DELIVERY of 3-P Punches and Die Buttons is made possible because over 37,000 Standard sizes are in STOCK. In fact, Porter Precision Products are stocked in all principal cities.
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The 3-P catalog can save you thousands of dollars. It contains a perfect pair — to answer every piercing need. PORTER head PUNCHES and DIE BUTTONS are made from three types of finest tool steel, and are offered in any DECIMAL size.
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CIRCLE INFORM-A-GRAM KEY NO. 1571

Automatic Hopper Feeders. They're used with centerless and disc grinders; drilling, broaching, and milling machines; pipe and tube threaders; presses, etc. The complete line is illustrated and discussed, complete with specifications, in a bulletin from Feedall Inc., 38399 Pelton Rd., Willoughby, O., or — **Circle Inform-A-Gram No. B75.**

Flatten Wire in diameters from a few thousandths of an inch up to one inch at speeds to 3000 fpm with the Waterbury Farrel 2-high wire flattening mills. They'll handle ferrous, non-ferrous, and clad metal wire. An illustrated booklet gives details on the mills and auxiliary equipment. Circular 731-R may be obtained from Waterbury Farrel Foundry & Machine Co., Waterbury, Conn., or — **Inform-A-Gram No. B76.**

Solid Carbide Cutting Tools are listed in Catalog B from Grawell Carbide Tool Co., 5680 — 12th St., Detroit 8. Each tool is shown, described, and its specifications given. The company is also equipped to manufacture special tools which are not in the catalog.
Circle Inform-A-Gram No. B77.

CUT INSPECTION TIME!

Micro-Height Gage reads faster than a micrometer! You measure from zero at base to 3". Hundredths on barrel...*thousandths* on big head that cuts reading time. Add dial indicator and you quickly measure between holes, surfaces.

GREIST MICRO-HEIGHT® GAGE

CUT LAYOUT TIME!

Easy-reading Micro-Height measures and scribes faster than any vernier gage... with less chance of error! Risers give you ranges to 9". Accurate Micro-Height, finished in satin-chrome, quickly pays for itself!

Write for catalog with prices.

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Precision Products since 1871

CIRCLE INFORM-A-GRAM KEY NO. 1581

Precision, Ease of Setup, Faster Feeds, and heavier stock removal are possible with Landis precision cylindrical grinders. A booklet contains photos and descriptions of integrated production lines, automatic grinders, and standard machines. Sketches are used to clarify the grinding operations. The booklet, "Landis Grinders at the Machine Tool Show", is supplied by Landis Tool Co., Waynesboro, Pa., or — **Circle Inform-A-Gram No. B78.**

Why Waste Your Profits On Makeshift Setups? Northwestern Tool believes its line of clamping and hold-down tools will cut the cost of making tools. The complete range

of tools for ⅜" thru 1" bolt sizes is presented in Catalog 23. Northwestern Tool & Engineering Co., 116 Hollier Ave., Dayton 3, O., or — **Circle Inform-A-Gram No. B79.**

Fabricating Operations using mild, hard-tempered, or stainless steels; aluminum; brass; or copper in gauges 0.020 to 0.093 are served by the Woehr roller-leveller. It operates at a standard speed of 56 ft/min. Details on Model 11F are given in a bulletin released by F. A. Woehr Machine Co., 17 Favor St., Rochester 8, or — **Circle No. B80.**

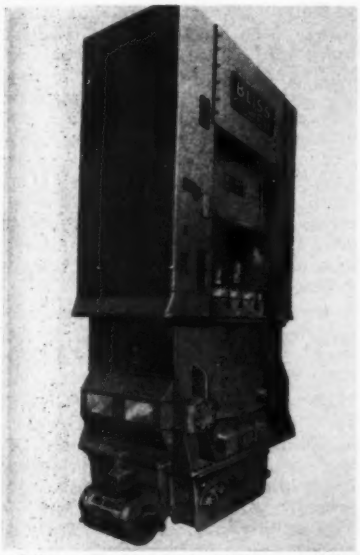
An Improved Method for finish machining holes from the solid is pictured and described in Bulletin 31154 from Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32. Using the "Bor-Drill" reduces the cost of machining straight, accurate holes. It can be used for machining deep holes in solid metal or for finishing cored holes in castings.
Circle Inform-A-Gram No. B81.

Automatic Bar Machines are detailed in a Greenlee catalog. The advantages of these accurate, flexible machines are shown and discussed. One section is devoted to tools and attachments and another to special-purpose bar automatics. Copies of Catalog A-405 are supplied by Greenlee Bros. & Co., Rockford, Ill., or — **Circle Inform-A-Gram No. B82.**

Redesigned Press Features Improved Operations

An improvement in the design of the Bliss new link type underdrive press completely eliminates one of the major causes of a press sticking at bottom center. The new design is now standard on all Bliss presses of this type.

No sticking difficulty has ever been encountered in the highly successful link type overdrive press originally developed years ago by E. W. Bliss of Canton, Ohio. However, the long pull-down rods required by the new underdrive design present a different problem. As a result, the rockshaft mechanism has been redesigned so that it comes to within a few degrees of bottom dead center (and no closer) when the slide is in the closed position. This gives an enormous mechanical advantage, because it permits maximum force at the dies without bringing the rockshaft to bottom dead center.



Like all current Bliss models, these link type underdrive presses have been designed for operation in "automated" factories. The underdrive system provides a low crown that leaves ample head room for cranes in one-story plants. All piping and wiring for press controls, automatic work-handling devices, and maintenance power tool outlets have been built into the uprights. This not only results in a clean, uncluttered exterior, but also provides a "packaged" unit that can be quickly installed with a minimum of pipe and wiring connections. It also relieves the purchaser of the burden of responsibility for proper installation.

Maintenance of the new presses has been simplified by carrying over the "packaging" approach to include sub-assemblies. For example, the clutch and brake have been standardized and unitized and all main gearing is located in a single removable gear case.

Every press is fitted with two lubrication systems, one high pressure and one low pressure. Counterbalance cylinders and cushion internals are lubricated automatically by an impulse timer that counts the number of strokes made by the press and actuates a 3-way solenoid-operated valve for a pre-set period of seconds.

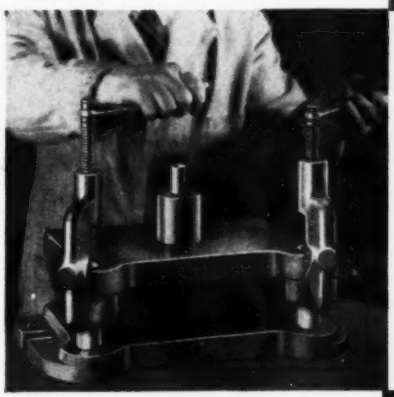
Films To See

The movie, "Automation Today," shows how automation has been applied to lighten man's load in a variety of industries. Mechanical Handling Systems Inc., held a premier showing of the film recently, in connection with its part of the program at the 2nd Annual International Automation Exposition in Chicago.

ACRO DIE SET PULLERS

...with Indexed Screw Wrenches for Uniform Lifting

Here's the die set puller for uniform, easy lifting of die sets. The principle of the Acro Die Set Puller is to remove the punch holder from the die shoe by a straight upward pull, whereby punch holder travels upward from die shoe axially, leaving freely from both leader pins simultaneously. This is accomplished only by use of the *indexed* screw wrenches which act as indicators, controlling the upward travel. This is an exclusive patented Acro feature, found only in Acro Die Set Pullers. They are available in three sizes and further descriptive material will be sent upon request.



OTHER ACRO PRODUCTS

Consist of modern drill rod racks, leader pin oilers, wing nuts and automatic lubricators. Write for additional information. Ask for bulletin TP-56P.

ACRO

METAL STAMPING CO.

340 E. RESERVOIR AVE.,

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CIRCLE INFORM-A-GRAM KEY NO. 1591

ORGANIZATION, THE KEY TO PROFITS

by Donald H. Sunderlin
SUNDERLIN ORGANIZATION
Consulting Management Engineers
Cleveland, Ohio

EXPERIENCED CONSULTING MANAGEMENT ENGINEERS have long realized that **organization** is the most important factor in the formula for attaining corporate success. This view becomes unavoidable after repeatedly seeing all commercial maladies trace back to deficiencies in one or more of the five components of organization: Policies, Personnel, Relationships, Procedures, and Controls.

The importance of organization is re-emphasized by an article in the December 1955 issue of **The Management Review.** Titled, "Ten Problems That Worry Presidents," the article highlights a three-year study conducted among the members of the Young Presidents' Organization. While a "young president" must have attained his position before age 40, his problems are not limited to executives of his age.

One of the principal findings of the study is this: "From the day they take over the reins of business control, most chief executives are secretly as dissatisfied with their own work as with that of their most bumbling employee, and their desire to improve the quality of their decisions and activities is as intense as their drive to increase company profits."

Another interesting disclosure is that the ten problems which cause Presidents the most concern are:

1. Utilizing Inherent Assets. Over half of those surveyed indicated that they had either made a spectacular success or a dismal failure of capitalizing on the factors responsible for the company's success. The respondents are continually searching for the answer to the question, "What are the essential factors that produce success in my company?"

2. Building Their Team. The stickiest problem is finding, training, and motivating the team members through whom the President must get results. Obligations to men, whose former contributions were substantial, complicates the problem. Personal friendships, family relationships, and stock ownership are additional conditions to be contended with. Over a third of those polled said that their worst mistake was keeping a man who did not fit, or failing to get one who did.

3. Using Their Time Most Effectively. The young Presidents said that they are constantly plagued by the thought that they have more work to do and more people to see than they can satisfactorily handle.

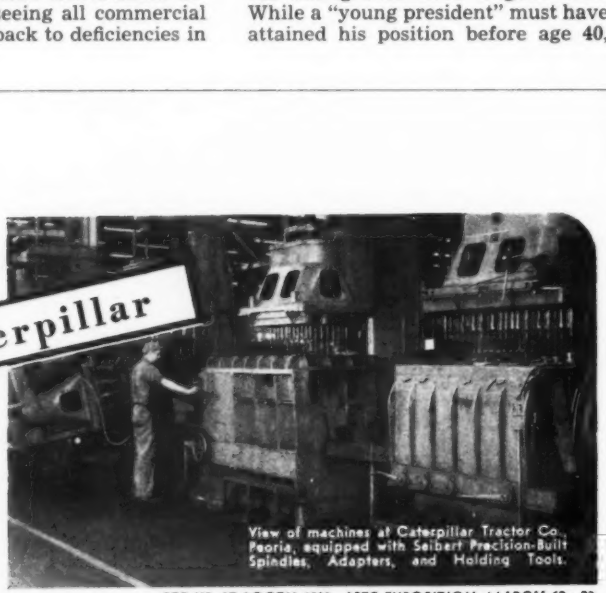
4. Making the Transition from "Doing" to Administering. The change from doing things themselves to reaching the goal through others is exceedingly difficult for the young men to make. Parenthetically, we might add that older men who were outstandingly effective when working alone were still found to be floundering after a decade in the top position.

5. Making Crisis Decisions. The necessity of acting as chief fireman whenever a crisis arises is their constant worry. While the qualities that made them President in the first place enable them to meet each crisis, the uncertainty as to when a conflagration will break out and their too frequent recurrence, is disturbing.

6. Taking a Personal Hand. More than a quarter of the Presidents said that they had sat in on negotiations last year when that issue, or others, involved big money.

7. Profiting by Expert Advice. The Presidents of small and medium sized companies have not yet real-

Caterpillar

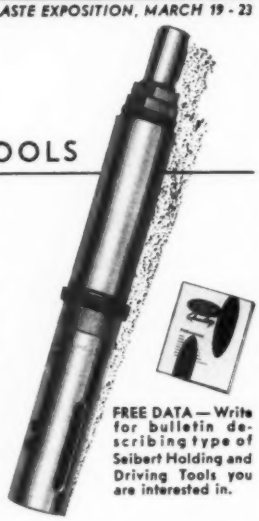


View of machines at Caterpillar Tractor Co., Peoria, equipped with Seibert Precision-Built Spindles, Adapters, and Holding Tools.

SEE US AT BOOTH 1500, ASTE EXPOSITION, MARCH 19 - 23

12 Year User
OF
SEIBERT PRODUCTION TOOLS

● Like any other reputable manufacturer, large or small, we are especially pleased when the products of our labor are accepted for tests and eventually approved for actual service by a manufacturer or machine tool builder. Yet, being realistic, we know full well this is only the beginning. The acid test comes later, proving our ability to maintain high standards of quality and a constant, dependable service day-in and day-out over a period of years. It is therefore, a source of deep gratitude and satisfaction in that we have, over a period of years, been privileged to serve so many fine companies like Caterpillar Tractor Co. who serve others so well.



FREE DATA — Write for bulletin describing type of Seibert Holding and Driving Tools you are interested in.

◄ Upper and Lower Drive Assemblies
◄ Pinion Drive Shafts
◄ Universal Joints
◄ Bracket Spindle Assemblies
Adapters ►

SEIBERT

SEIBERT & SONS, INC. CHENOA, ILLINOIS
Quality MULTIPLE DRILL SPINDLES AND PRODUCTION TOOLS
CIRCLE INFORM-A-GRAM KEY NO. 1601

ized, as have their counterparts in the larger companies, the advantages to be gained from management consultation. Or, they feel that they cannot afford advice of this kind. Specific areas in which they acknowledge that they need help include: personnel advice on the upper levels, marketing research, sales planning, product development, financial counsel, and long term planning.

The remaining three problems were: searching for a creed, improving their administrative skills, and finding additional working capital. As these are less closely dependent on sound organization, they will not be discussed.

Sound Organization Minimizes Problems

In his book, "The Fundamentals of Top Management" Professor Ralph C. Davis singles out as the principal attributes of good business organization:

1. Effective executive leadership.
2. Sound business objectives and policies based on competent analysis of customer needs.
3. Sound functional relationships as determined by objectives.
4. Adequate physical implementation making possible the economical, effective achievement of objectives.
5. A complement of abilities, both executive and positive, to handle present business problems economically and effectively.
6. Organizational stability.
7. Organizational flexibility.
8. Organizational capacity for growth.
9. Organizational balance.
10. Good organizational morale.

Starting with problem number one and following through in sequence, it will be seen that the cause of each problem emanated from defects in some phase of organization.

Utilizing Assets

The phenomenal success of one company was based on the introduction of a single, big value, hardware item at the start of the present building boom. After capturing nearly 2/5 of the market from the long established manufacturers, its unique advantage was lost by adding a high priced, low volume version and by filling the chinks in the product line. The greater market coverage, obtained at the sacrifice of high volume in a few, fast moving, sizes was far less profitable than another new and timely product which would skim the cream off the market and leave the milk for the competition.

Clearly, the function of new product development was under-emphasized or poorly implemented in this company's organization plan.

Building Their Team

After enjoying large profits for 40 years, a company found itself with heavy cash reserves but no earning power. The young, progressive executives had gone with competitors and the remaining older men had become too conservative and somewhat pessimistic. Neglect of the personnel phase of organization had been the cause of this situation. Happily we can report that the company is again on the up-grade, following an organization study and the addition of a few top men having the qualities of the founders.

Using Their Time Effectively

Every stage of a company's development causes different demands on a top executive's time. Therefore the right way for the President to spend his time today, could be the wrong way tomorrow. The general trend should be toward planning, organizing, directing, coordinating, and controlling.

This was the course followed by a General Manager of Frigidaire who later became a Vice President of General Motors. His first act as Manager was to learn why the refrigerators did not go together properly. He got to the root of the matter by acting as foreman of the assembly line. After making necessary corrections, he moved into his office and managed in the conventional manner.

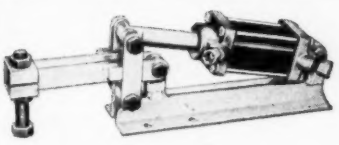
HEAVY-DUTY AIR (or Oil) CLAMPS

Never send a boy TO DO A MAN'S JOB

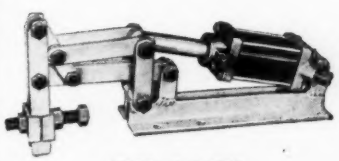
If you are developing a fixture to hold an automobile panel or other large assembly, it's a good idea to have the clamps rated to the job they're expected to do. In other words, never send a boy to do a man's job!

You can get husky, heavy-duty clamps from Lapeer—clamps which are built to stand up under the knocks and abuses of busy production lines. These clamps are air or oil operated—designed to grab tightly, let go quickly. Failure of air or oil pressure will not release the clamps, thus eliminating the possibility of scrappage.

Pictured are just two of several heavy-duty models available.



AO—400 (HD)



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CIRCLE INFORM-A-GRAM KEY NO. 1611

Sometimes it is necessary for the boss to take over but if the demands for his help are not tapering off, it is an indication that some phase of organization is weak. Organization, generally recognized as the major reason for General Motors becoming the world's greatest business, shows the chief executive where his efforts should be concentrated at all times.

Becoming An Administrator

For a former doer to become a manager is indeed difficult; particularly when he knows he can do better than most of his subordinates, on their own jobs.

A comprehensive Organization Manual, by spelling out objectives, responsibilities, relationships, specific duties, and the standards by which each executive is judged, is of inestimable help in assisting others as well as the chief executive to make the transition from "doer" to "get it done-er."

Making Crisis Decisions

Crash programs are never completely eliminated, even in excellently managed companies. But the Eastman Kodaks have few as compared with the many confronting companies with smaller management statures.

Sound policies, well thought out procedures, and effective management controls prevent crises for the most part and minimize their disruptive effect when they do occur. These three phases of organization were mentioned earlier.

Profiting By Expert Advice

A small Cleveland manufacturing company made so much money through management consulting services that it was able to purchase a beautiful new plant on the fast growing west side of town. Its original factory was a small brick building located behind three dwellings.

The seven-fold growth in management consultation since the war provides ample proof of its increasing acceptance and whether it can be afforded may easily be ascertained.

Most of the consulting firms satisfy themselves that their engagement would be worthwhile for the client before they accept an assignment. They analyze the situation, determine the indicated corrective program, its cost, and the probable savings. We would refuse an assignment if the cost were not returned the first year. In fact, we believe that a client should receive ten dollars for every dollar he spends. The only outlay is a small expenditure for pump priming during the preparatory stages.

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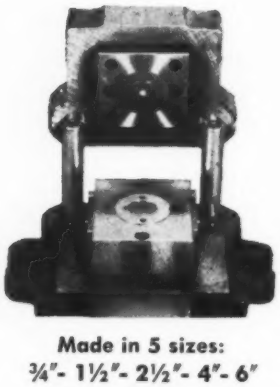
"You, too, should make washers the economical Hovis way. Save time, labor, materials and storage space"



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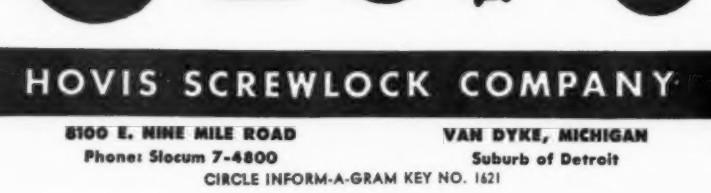

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CIRCLE INFORM-A-GRAM KEY NO. 1621

Carbide Cutters Withstand Severe Interrupted Cuts

Facing forged steel lugs inside a pressure vessel and machining an eccentric shaft of hot rolled bar stock — both severe interrupted cutting operations — are two recently reported applications that demonstrate the edge strength and resistance to breakage of Kennametal Grade K21.

The pressure vessel made of boiler plate was worked on at the Newport News Shipbuilding and Dry Dock Co. in Virginia. Here the new Kennametal steel cutting carbide was used to face four lugs welded to the interior of the vessel.

Rough turning the SAE 1045 eccentric shaft was a rugged interrupted cutting job performed at the Niagara Machine and Tool Corp., Buffalo, N. Y.

To machine the lugs, using a 50-hp, 12' Cincinnati Hypro vertical mill and a GR-24 style brazed tool, it was necessary to extend the ram of the vertical mill 42". The tool projected another 4⅜".

The jolting jump cut presented by the four lugs had caused severe

chipping and breakage when other carbide materials were used. As many as three tool changes were required to machine one piece. With Grade K21, two to four pieces were machined per grind — and without chipping.

Diameter of the cut was 46½" at 340 sfpm and 0.015" feed. Maximum depth of cut for each pass was ⅞". After several tool regrinds, the depth of cut exceeded the length of the tip and resulted in some wear on the shank. However, despite this rough usage, the Grade K21 tip was not damaged.

Fig. 1. Facing four 2½" dia forged steel lugs, welded to the inside bottom of a pressure vessel made of boiler plate, represented a tooling problem at the Newport News Shipbuilding and Dry Dock Co., in Virginia. The problem was solved by using Kennametal Grade K21.

The Niagara operation consisted of turning 5¾" dia bar stock — ¾" off center — with a standard Kennamatic Style TAR-86 triangular insert tool. Three other grades of inserts had been used for machining three shafts with one cutting edge of each insert. One grade had considerable top wear — about 0.020"—while another showed 0.015" edge wear with chipping of the cutting edge. There was little edge wear and no chipping with K21.

Length of the cut was 10½" and five cuts, with 7/16" maximum depth of cut, were required to reduce the end of the shaft to proper diameter. The first two cuts were the most severe and were made at 141 rpm while the remaining three cuts were made at 181 rpm. Using a 15-hp Monarch engine lathe, the feed per revolution was 0.018. The inserts are indexed to a new cutting edge after every six shafts or 30 cuts. Edge wear after this number of pieces is approximately 0.020".

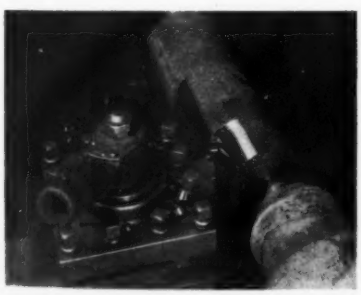
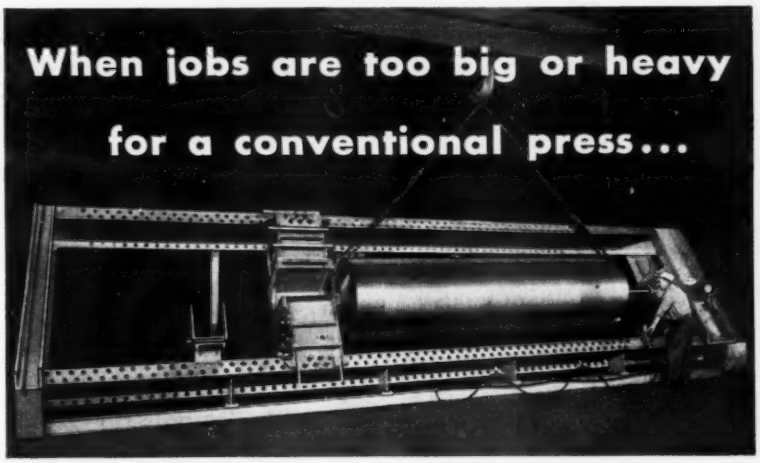


Fig. 2. A Kennametal Style TAR-86 tool with a Grade K21 triangular insert was used to turn the end on this eccentric shaft of SAE 1045 hot rolled bar stock at the Niagara Machine and Tool Corp., Buffalo, N. Y.

NEW CARBIDE DEVELOPED FOR GENERAL MACHINING

A new grade of carbide, known as NS-3, has been developed for general purpose machining and milling of steel forgings, castings, weldments, plate, and highly abrasive steels.

Performance data on this new carbide, manufactured by Newcomer Products, Inc., Latrobe, Pa., has been obtained from actual use in industry. Experience shows that grade NS-3 has exceptional high edge strength and resistance to shock and chipping. Because of its versatility and wide range of general purpose uses, NS-3 simplifies choosing the proper grade of carbide for a particular steel-cutting job.



THE DAKE HORIZONTAL INCLINED PRESS is recommended for work on jobs that are so big or heavy that it is more convenient to do press work while they remain suspended from an overhead crane or hoist.

For instance in the illustration above, a 7-inch shaft is being pressed into the cable drum for a 200-ton overhead traveling crane. The drum is 17 feet long and 4 feet in diameter, and is supported on a crane hook.

This particular press (Model 32-100) is 33 feet long overall, and has a daylight opening of 25 feet. It has 300 tons capacity, a 60° inclined frame, 26-inch stroke, and a ram-to-table distance from 25 inches to 25 feet. The table is moved along the frame with a hand winch.

Dake Hydraulic Presses are engineered to meet such a variety of shop requirements that the engineering is probably almost done on the press you need. Let us quote.

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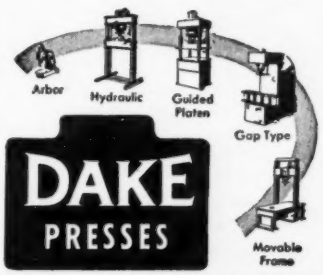

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CIRCLE INFORM-A-GRAM KEY NO. 1631

VACUUM BRAZING OF JET ENGINE PARTS INVESTIGATED

Vacuum brazing, a logical evolution in vacuum metallurgy arising from vacuum sintering and vacuum melting, is currently being investigated by a number of firms in this country and holds promise of becoming an increasingly important production process.

By brazing under high vacuum, in an atmosphere free of oxidizing gases, a superior product, with greater strength, ductility, and uniformity, may be obtained more economically than by brazing methods previously used.

Pratt & Whitney Aircraft division of United Aircraft Corporation, in East Hartford, Conn., is typical of the firms carrying on investigations of this new process. The Connecticut aircraft engine builder has pioneered in exploring the application of vacuum brazing to the production of jet engine components, such as fuel manifolds, using for this purpose a new Stokes vacuum furnace recently installed. Both test pieces and complete assemblies have been brazed under vacuum.

Pratt & Whitney's tests have shown that where copper was used as the brazing material, quantitative shear strengths of joints formed in stainless steel and nickel alloy test pieces by brazing in vacuum, hydrogen, and dissociated ammonia were similar, showing no pronounced superiority for the vacuum-brazed joints.

Peel tests showed that vacuum brazing of stainless steel to nickel-base alloy produced tough, ductile joints which were estimated to be more ductile than those obtained by brazing in normal atmosphere.

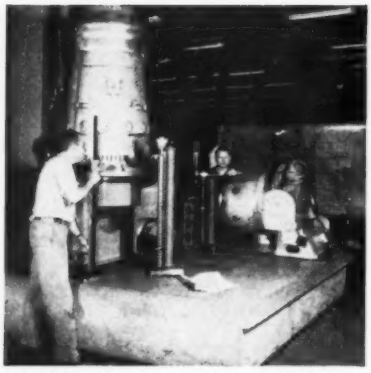
Fig. 1. Workmen attach thermocouples to a group of jet engine parts preparatory to vacuum brazing.

For vacuum brazing, the components are mounted on suitable fixtures and "wired" for brazing. This involves placing one or two turns of brazing wire around each joint. They are then enclosed within the furnace — a double-shell vacuum chamber which is lowered into position from overhead by means of vertical tubular guides. The space within the retort, or inner shell of the chamber, may be evacuated to a pressure of 0.05 micron or less. Resistance-heating elements supported by the outer shell and located in the space between the two walls of the furnace, raise the internal temperature of the retort to about 2150° F. The brazing wire melts and infuses deeply and thoroughly into the tiny crevices of the joints between the tubes and the fittings of the assembly — due to the high vacuum which has been drawn. When it cools, the brazing metal solidifies and joins the several elements of the assembly together with uniformly strong, permanent joints.

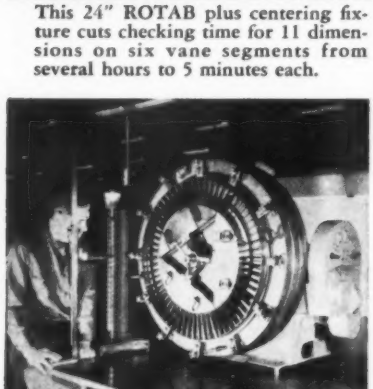
The specially designed Stokes vacuum furnace installed at Pratt & Whitney is the first such unit to be built which is designed for large-scale production of these components. The double-wall construction, prevents the oxidation that would occur if the internal heating element were located in the same chamber as the work, and the work

ROTABS Beat Precision Inspection Costs...

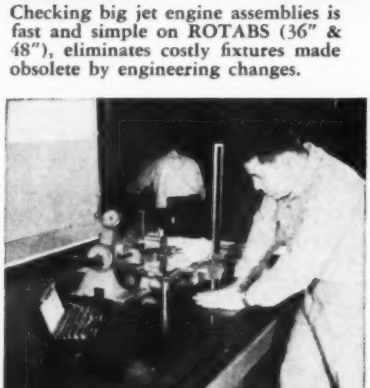
This 24" ROTAB plus centering fixture cuts checking time for 11 dimensions on six vane segments from several hours to 5 minutes each.



Checking big jet engine assemblies is fast and simple on ROTABS (36" & 48"), eliminates costly fixtures made obsolete by engineering changes.



Seconds-of-arc precision allows quick, accurate inspection with low cost standard gages. Here 36" powered unit checks vane spacing.



For small parts inspection this 12" universal ROTAB minimizes setup and inspection time, does not require power for tilting and rotation.

For complete data on the optical precision readings you get with the ROTAB at the lowest cost, write:

MACHINE PRODUCTS CORP.

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CIRCLE INFORM-A-GRAM KEY NO. 1641

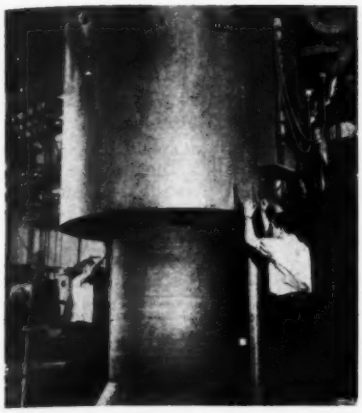


Fig. 2. The furnace shell (which contains the heating element) is lowered over the retort which encloses the work. Water-cooled O-ring seals provide a tight vacuum seal.

were thus exposed to the gases emitted from the heating element.

O-ring seals in the mating flanges of each wall of the retort provide a tight vacuum seal, and are protected by water-cooling from the high temperatures, produced within the chamber.

A Stokes 10" booster pump of the new "Ring-Jet" design, and a Stokes Model 412 "Microvac" rotary mechanical fore-pump, located on the floor below the furnace, provide ample capacity for rapid evacuation of the inner chamber to the high vacuum desired. Another small mechanical vacuum pump evacuates the space between the inner and the outer shells of the furnace to a somewhat lower vacuum.

Duration of the vacuum brazing cycle is about a day and a half, or comparable to that with hydrogen-atmosphere brazing.

———•———

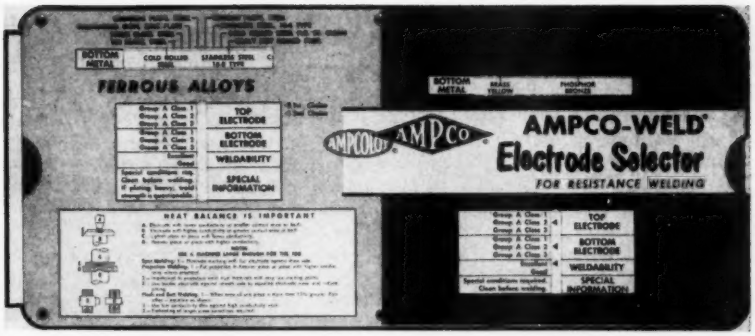
This "Ampco-Weld" Electrode Selector presents the metal properties needed for resistance welding.

The side shown covers ferrous and non-ferrous metals. The information includes the first and second choices of top and bottom electrode and weldability for any combination of common materials.

In addition, the importance of heat balance is noted. Also listed are points that are of value in spot, projection, and flash and butt welding.

On the reverse side of the selector is the "Ampco-Weld" data chart with conversion data (weld time, current, and pressure) on the commonly welded metals. This side tells the thickness of the thinnest outside piece and has spot welding schedules and seam welding for clean, low-carbon steels.

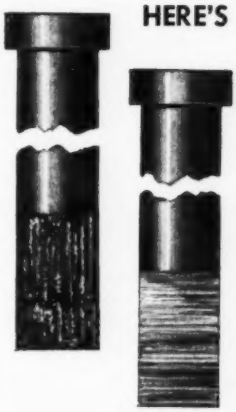
For copies of the Electrode Selector, write to Ampco Metal, Inc., Milwaukee 46, or — **Circle No. D1.**



DURABLE

The 1-2 PUNCH that KO.'s
PRESS DOWN-TIME
PRODUCTION DELAYS

HERE'S THE SECRET OF DURABLE'S SUCCESS:



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. . . gives a "grinding grain" parallel to plane of action—reduces friction, heat, firing and galling.

2. ELECTROCOATING
. . . chrome carbide has 25% less friction than plain steel—further reduces friction, heat, firing and galling.

The DURABLE combination of VERTICAL LAPPING plus ELECTROCOATING knocks out your production delays with fewer shut-downs, less die maintenance, longer uninterrupted production. Vertical Lapping and chrome electrocoating make the Durable Patent Piercing Punch the perfect answer to YOUR PERFORATING PROBLEMS.

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IF IT'S DURABLE IT'S DEPENDABLE

DURABLE NIB PUNCH gives improved punching on harder alloys.

DURABLE INTERMESH SLEEVES supports Punch so as to perforate metal many times thicker than hole diameter.

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1214 W. Madison Street, Chicago 7, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 165!

THE TIME IS NOW!

by James M. Apple
Professor of Industrial Engineering
MICHIGAN STATE UNIVERSITY
Lansing, Michigan

WITH COMPETITION becoming more keen every day, the time will never be better to take a close look at value received for each dollar paid out. The General Electric Co. calls this "value analysis," which they describe as "equivalent performance at lower cost." This philosophy could also be expanded to consider the search for better performance at the same cost.

What do we mean by "value received"? Primarily, "Are you getting your money's worth," for parts purchased or produced. Of course you are! You think! But how long has it been since you took a component of your product, put it up on a pedestal for all to see, and asked: "Is this the best we can do?"

One plant does exactly this, in a meeting of plant personnel from product engineering, process engineering, methods engineering, purchasing, accounting, and sales, at the rate of one part per week. Their procedure is rather informal — just "pot shots" by anyone, regarding anything. All ideas are considered, and the results are surprising, in terms of cost reduction.

Another plant selects parts at random, mounts them on a poster, indicates the present cost of manufacture or purchase, and asks: "Can we do better than this?" The display is placed in a conspicuous spot near the cafeteria. Again, results of employee suggestions have been amazing.

If such informal techniques for "value analysis" are beneficial, a planned program should be even better. Such an approach should help to show that excess cost is often hidden in traditional ways of doing things, which always appear easier. This is primarily because it is so simple to continue current practice and so difficult to initiate a change. Here then is a suggested approach to a "value analysis" program.

First, let's point out the overall procedure to be followed, then indicate more specific areas for investigation. The overall approach is merely an adaptation of the "scientific method," somewhat as follows:

1. Select a part.
2. Check all possibilities — design, process, material, method, source.
3. Get all the facts, data, details.
4. Develop each alternative.
5. Determine the costs.
6. Decide on the basis of facts.

This procedure should be applied to every part. Subject it to the questioning of each qualified person, or group, in the search for improvement possibilities. As an aid to the orderly approach to the problem, here are some specific suggestions or ways of finding possible sources of additional value per dollar. Two avenues of approach are product approach and process approach:

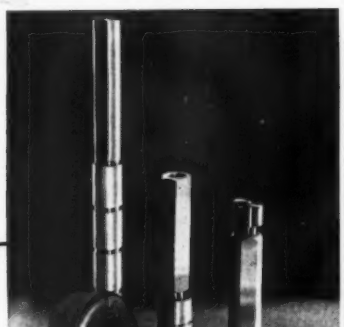
I. Product Approach

A. Study the **function**
   1. What function does it perform?
   2. Is it a necessary function?
   3. Can part be eliminated?
   4. What else could do the function better?
   5. Can part be combined with another part?
   6. Can function be simplified?

B. Study the **design**
   1. Can the design be simplified?
   2. Can tolerances, allowances, limits be changed for easier processing?
   3. Are controls easily operated? Convenient?

Professor Apple's article is from INDUSTRIAL ENGINEERING NEWS, No. 26, Michigan State University's Mechanical Engineering Department, and published here by kind permission.

Don't *Scrap* Your Worn Gages



Lincoln Park

Will Salvage Them By Hard Chrome Plating or Carb-O-Plating

When your gages have apparently outlived their usefulness, then is the time to send them to Lincoln Park for salvaging.

Two methods are used—either hard chrome plating or Carb-O-Plating. In the chrome plating process, the gages are carefully prepared for plating, are hard chrome plated, and then finished. When Carb-O-Plating is employed, a thin wear-resistant coating of tungsten carbide is applied over the steel base. This coating has approximately the same properties as sintered carbide—92% tungsten carbide and 8% cobalt.

In both cases, the gages are not only restored to exact size and tolerances, but provide a wear life far in excess of that of the original gages. If you're looking for new ways to cut inspection costs, it will pay you to investigate Lincoln Park's salvaging processes. Let us send you full information.

THE PLUS IN PRECISION

Lincoln Park INDUSTRIES, INC.

1719 FERRIS AVENUE • LINCOLN PARK 25, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1661

C. Study the **material**
1. Consider new **forms**
   a. bar stock
   b. sheet
   c. extrusions
   d. rods
   e. etc.
2. Consider alternate **materials**
   a. plastic
   b. aluminum
   c. wood
   d. glass
   e. steel
   f. etc.
3. Consider alternate **sources**
   a. should we make or buy?
   b. can we use an alternate part?
   c. can we use a standard part?
   d. can we sub-contract?
4. Check purchasing **quantities**

II. Process Approach
A. Study the existing **processes**
1. Is it the best process?
2. Are there any new developments?
3. Can it be simplified?
4. Have other possible processes been considered?
   a. hot heading
   b. cold heading
   c. forging
   d. swaging
   e. molding
   f. die casting
   g. thread rolling
   h. investment casting
   i. welding
   j. stamping
   k. powdered metallurgy
   l. extrusion
   m. electrostatic painting
   n. supersonic cutting

B. Study the individual **operations**
1. Can it be eliminated?
2. Can it be combined?
3. Can it be changed in sequence?
4. Can it be simplified?

Make an operation process **chart**, showing each operation on each part, as a guide in this approach. Check off each operation as it satisfactorily passes the "exam."

Why not extract or adapt, from the above outline, those angles which pertain to your product? Work them up in the form of a check sheet to be filled out as each part is "put on trial." Existing practices often break down under the questioning, resulting in clues which lead to more value per dollar.

Let's get started—not later—but today! The time is now!

PROTECT YOUR FUTURE BUY U. S. SAVINGS BONDS

HIGH SPEED FRICTION SAW CUTS HARDEST STEEL

Whirling at a speed of 25,000 rpm, the Kling high speed friction saw, operating in the Material Department of the Douglas Aircraft Company, Inc., cuts through the hardest kind of steel in a fraction of the time required by a machine-operated hacksaw blade.

Tooling and maintenance structural materials now are sawed in seconds rather than minutes. For example, it formerly took 8 min to cut an 8" "I" beam, but the Kling saw does the job in only 9 sec. And 8" dia steel pipe can be cut through in 12 sec, whereas the hacksaw method took 12 min.

Powered by a special 75-hp motor, the 56" steel disc, with its ⅛" deep serrated edge, is mounted directly on the motor shaft.

All types of steel are cut rapidly and economically by a softening process. When the revolving blade

INCREASE PRODUCTION WITH SAFETY!

A NEW ATTACHMENT FOR PRESSES WITH MECHANICAL CLUTCHES

We offer a dual push-button solenoid operated trip attachment that will help increase production. Relieves fatigue with its ease of operation. Two hands must be on the controls when press is tripped. Both buttons must be pushed to trip the press, and both buttons must be released to again trip the press. This prevents an operator from beating the safety attachment by use of rubber bands, sticks, elbows or other means. A reset mechanism is actuated by back contacts of push buttons, requiring definite use of two hands by the operator.

Trip attachments give you these features:

• Dual mushroom type push buttons with reset contacts • 110 volt solenoid housed in aluminum box • Red warning light • Reset relay and micro-switch • Wiring and cord set for plugging into standard electrical outlet • Adjustable connecting links. Foot switch also available.

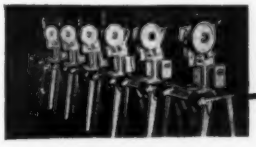
Junior Package Unit, less table $94.50
Complete with table $114.50

For larger presses up to 20 ton capacity such as the Perkins No. 351B.
Unit less table $125.00
Complete with table $145.00
Units available for heavier presses.

PERKINS No. 351B STANDARD INCLINABLE PRESS

20 ton capacity press equipped with electric solenoid safety trip attachment and work table, complete with motor and control.

f.o.b. Warren, Mass. $1345.00



Junior Presses with dual push button electric solenoid safety trips.

Perkins Machine Co. Warren, Mass.

PRESS BUILDERS FOR OVER 50 YEARS

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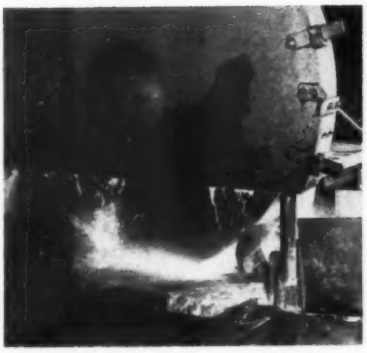
is forced against the steel, the friction of the blade generates an intense heat faster than the metal can absorb it. As a result, the contact surface of the steel is reduced to a sufficiently plastic stage to enable the blade to scrape off the surface quickly and easily. This softening and scraping continues for the entire cutting process.

Overheating of the blade, which would lessen its life, does not occur because the time it is in contact with the material is much less than the time it is exposed to the cooling action of the air.



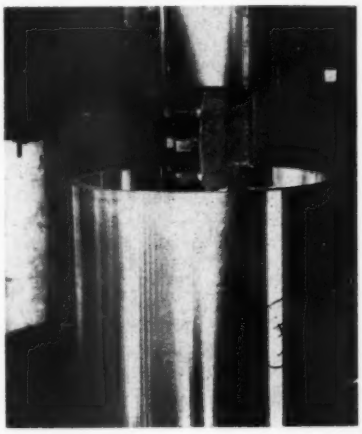
INDEXABLE TOOLING SOLVED DIFFICULT FINISHING PROBLEM

A switch from standard tipped tools to indexable tooling provided Farrel-Birmingham Company of Ansonia, Conn., the solution to a difficult problem—boring the inside diameter of cast aluminum bearing liners to a 20 micro-inch finish.

With a special Kendex tool holder fitted with a modified Style R16 Kendex insert made of Grade K8 carbide, a 16 to 18 micro-inch finish is now obtained consistently and the bore is held to within 0.001" on size and taper.

The insert is modified by increasing the 6° cutting relief to 8°. The top and the cutting relief are lapped and polished.

Farrel-Birmingham reports that the Kendex insert, produced by Kennametal, Inc., Latrobe, Pa., is rotated to a new cutting edge after boring five pieces in order to maintain a good cutting edge and provide the required finish. After



every 100 pieces, the top and cutting edges of the insert are relapped and the indexing cycle is repeated.

Kennametal reports indicate that little wear is obtained at a relatively light feed and depth of cut—0.008" per revolution and 0.005" depth. The cutting edges are reconditioned with removal of only a few thousandths stock.

During the operation — on a Bullard 56" vertical turret lathe Cutmaster — the cylinder liner rests on a flange-type fixture which is clamped to the machine chuck. A clamping ring, with four long bolts passing through it and threaded to the flange, holds the liner firmly during the operation.

The bearing liner has diameters of 18⅝" (outside) and 17" (inside) and is 18" long. Maximum speed of the machine during the operation is 200 rpm and 900 sfpm. Cutting fluid is kerosene.

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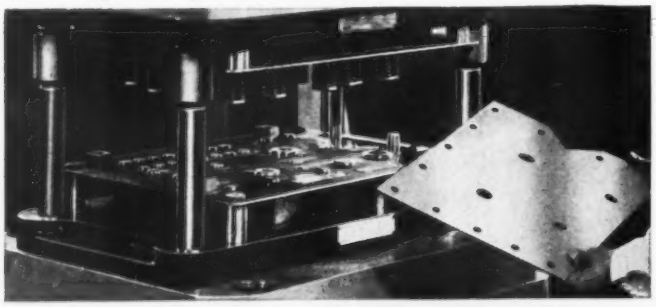
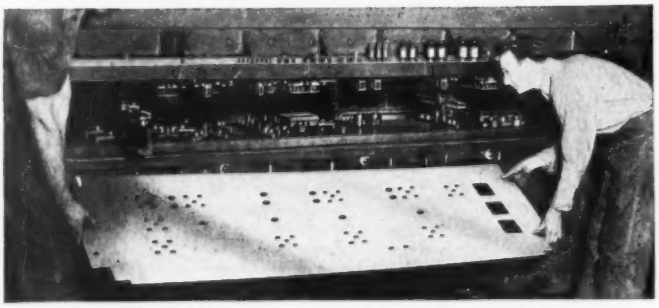
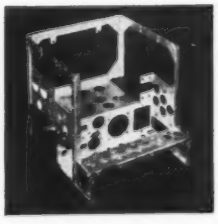


WHISTLER MAGNETIC PERFORATING DIES



WHISTLER ADJUSTABLE PERFORATING DIES



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1½	3	4	1	1½	1½	⅝	⅝	1⅝	⅞	2½	⅝-28	½	1⅝	⅞	1.458	2¼	⅝	½	⅝	⅝-18	1⅜	⅝	3⅝	1¼	2½	⅝	—	—
2	2½	4	1	1½	1½	⅝	⅝	1⅝	⅞	2½	⅝-24	½	1⅝	⅞	1.856	2¼	⅝	½	⅝	⅝-18	1⅜	⅝	4½	1¼	3⅛	⅝	—	—
2½	3	4½	1	1½	1⅝	⅝	⅝	1⅝	⅞	2½	⅝-24	½	1⅝	⅞	2.399	2½	⅝	½	⅝	⅝-18	1⅜	⅝	4½	1¼	3⅝	⅝	—	—
3	3½	5	1½	1⅝	1⅝	⅝	⅝	1⅝	⅞	2½	⅝-24	½	1⅝	⅞	2.651	3½	1	⅝	1½	1-14	1⅝	1	5½	1⅝	4¼	⅝	—	—
4	4½	5½	1½	1⅝	1⅝	⅝	⅝	1⅝	⅞	3	⅝-24	½	1⅝	⅞	3.402	4¼	1	⅝	1½	1-14	1⅝	1	6½	2	5⅛	⅝	—	—
5	5½	5½	1½	1⅝	1⅝	⅝	⅝	1⅝	⅞	3½	⅞-20	½	2	1	4.154	5⅞	1⅜	⅞	1½	1-14	1⅝	1	7½	2	6½	⅝	—	—
6	6½	6½	1½	2	2	⅝	⅝	1⅝	1	3½	⅞-20	½	2	1	4.993	7¼	1⅜	1	1½	1⅛-12	2½	1	8½	2½	7½	⅝	—	—
8	8½	6½	1½	2	2	⅝	⅝	1⅝	1	3½	1-18	⅝	2½	1	6.452	9¼	1½	1⅜	1½	1⅛-12	2½	1	—	2½	—	1	4½	10⁵⁄₁₆

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CIRCLE INFORM-A-GRAM KEY NO. 1693

Lewis Welding Decentralizes its Organization

Lewis Welding & Engineering Corp., leading producer of heavy weldments and special purpose machine tools, divided its operations under two autonomous divisions on Feb. 1, according to James T. Lewis, Jr., president. The separate organizations formed are the Lewis Welding Division in Bedford, Ohio, and the Lewis Machine Division, Euclid, Ohio.

R. Edward Stein, formerly vice president in charge of manufacturing, has been named vice president and general manager of the Welding Division and Edward W. Hollis has been appointed general manager of the Machine Division.

The change from a centralized organization was necessitated by the steadily increasing work load imposed on both units of the company, Mr. Lewis said.

"This heavy demand and the fact that our machine division is increasingly called upon to design and build specialized machinery led to the formation of the two divisions," he noted.

HEVI DUTY-BELLIS
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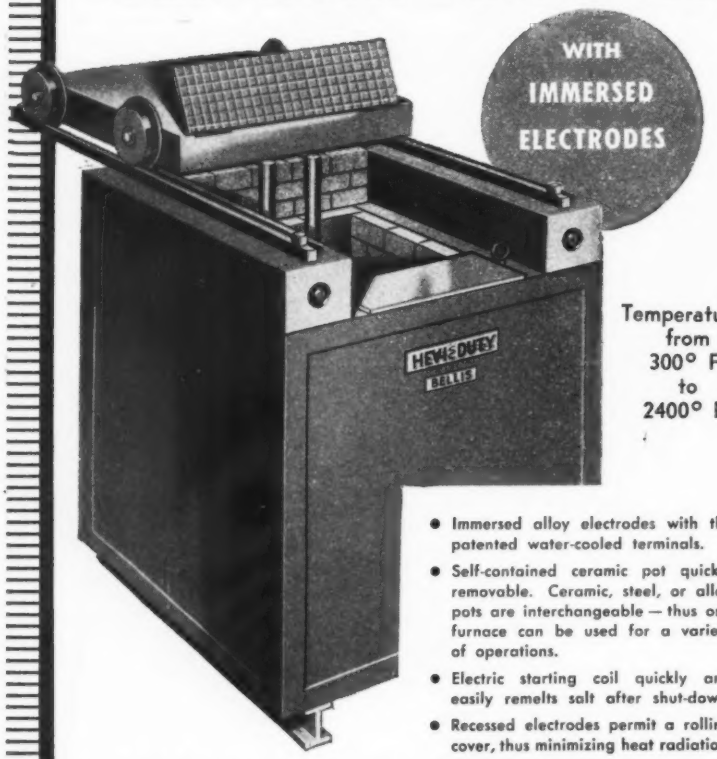

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CIRCLE INFORM-A-GRAM KEY NO. 1701

Rubber Sheet is Key to Flatness

by Dal Garrison

Technical Shops Division
Technical Services Department
U. S. NAVAL ORDNANCE LABORATORY

—in surface grinding bowed or twisted steel pieces . . . much quicker than conventional method of shimming with paper

SURFACE GRINDING OPERATIONS, where flatness and parallelism are of prime importance, usually involve the time-consuming job of shimming between the magnetic chuck and the workpiece. This is a must operation if the piece has been bent or bowed even slightly in a previous machining operation or warped in heat treatment.

In the grinding section of the U. S. Naval Ordnance Laboratory in White Oak, Maryland, this laborious shimming technique is regarded as outdated. Instead of shimming with paper, a sheet of soft rubber is placed between the workpiece and the chuck to provide a good seating for the work.

There are certain limitations, to be sure, to the use of rubber for this purpose. It has an insulating effect in a magnetic field and also becomes slippery when wet. As a result, good blocking of the workpiece is usually necessary. The rubber sheet must be of proper density or hardness and thickness for the workpiece to be ground, but selecting it will become almost second nature if the operator will keep the following two factors in mind:

1. Rubber sheet stock, both natural and synthetic, is available in almost any durometer hardness from 5 to 100. For this use, stock between 25 and 50 durometer, either natural or synthetic, works best.

2. The thickness of the rubber sheet used may vary from job to job, for three reasons: first, the strength of the magnetic field produced by the chuck; secondly, the relative mass of the workpiece to be ground; and thirdly, the variation from flat of the workpiece before grinding.

A magnetic chuck with a strong field will permit the use of a heavier gauge rubber sheet which will take up the irregularities in the workpiece more effectively and cause less strain to be put on it in grinding. Also, if one workpiece is of greater mass than another, the magnetic field will have correspondingly more

Mr. Garrison's article is from **Grits and Grinds**, Vol. 46, No. 11, copyright 1955 by Norton Company, and published here by kind permission.

metal to act upon and thus allow the use of heavier gauge rubber.

The variation from flat in a part to be ground may be in the form of a bow from end to end, or a twist which would cause it to rock on opposite corners. The rubber sheet used should always be at least twice as thick as the maximum variation. If it is found possible to budge the workpiece when the chuck is magnetized, this usually can be overcome by blocking.

As an example of the use of the above grinding technique, the White Oak Laboratory recently had a problem of surface grinding a piece of high carbon steel measuring 4" x 12" x .330" thick and heat treated to R_c55-58. The two sides had to be ground flat within .001" Total Indicator Reading; finished size was .250" + .000 — .001"; surface finish, 16 micro-inches rms.

Before grinding, the piece was found to have a twist as well as a bow from end to end of .031" T.I.R.

The first step in proceeding to grind the piece was to select the rubber sheet. While 1/16" sheet would have served the purpose the operator decided that the mass was great enough for ⅛" rubber of 35 durometer. If 1/16" rubber were used, it would have had to be harder than the ⅛" sheet.

The workpiece in turn was placed on the rubber sheet with the bow up as shown in the above sketch. Taking light cuts, the surface was partially cleaned up, then turned over, and the other side similarly ground. By repeating this procedure, removing small amounts of stock at a time, it was possible to grind both sides flat within the specified tolerance. If, after cleaning up both sides in this manner, a slight variation in thickness is found, this is probably the result of slight unevenness sometimes found in the rubber sheet itself.

Where it is necessary to hold the piece to a specified thickness, as in this case, the grinding (on rubber) was continued, removing equal increments of stock from each side, until the piece measured about .010" oversize or .260". Then the piece was ground precisely to size (.250") on a clean, flat chuck without the rubber sheet.

Where a steel part has had a corner bumped and mushroomed before heat treatment and is too hard to file easily, and also on the first rough grind on a casting, the use of a rubber sheet will prevent scratching or indenting of the chuck face.

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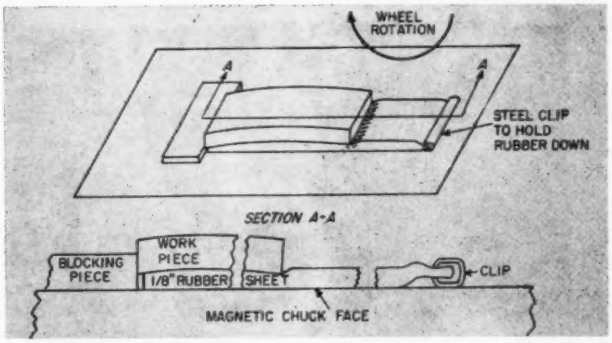

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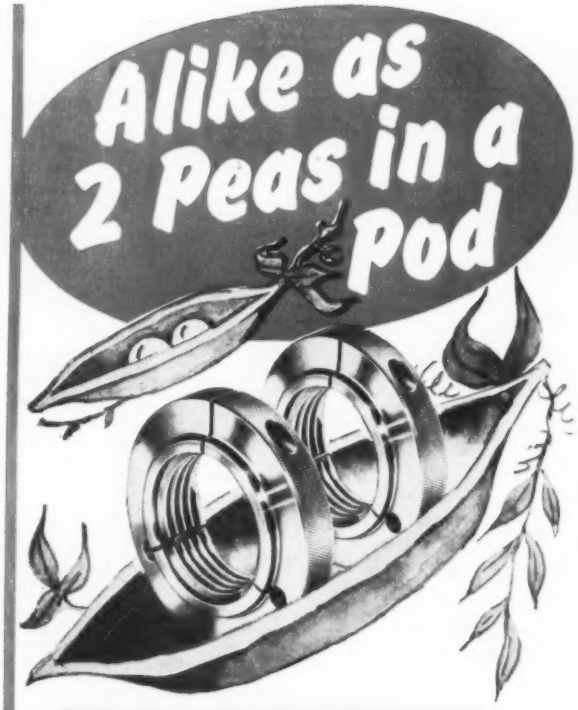

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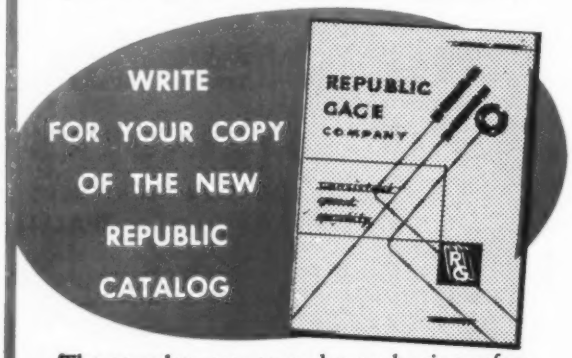

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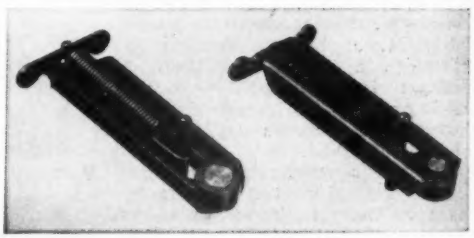
CIRCLE INFORM-A-GRAM KEY NO. 1722

FOR POSITIVE STOCK ALIGNMENT
IN PROGRESSIVE DIES



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CIRCLE INFORM-A-GRAM KEY NO. 1723

Ultrasonic Tests to Predict Forging Failures

Better understanding of a comparatively new inspection technique might have prevented the disastrous turbine explosion at the Ridgeland (Chicago) electric power station about a year ago. This was revealed at the recent diamond jubilee meeting of The American Society of Mechanical Engineers, by H. D. Emmert of Allis-Chalmers.

Emmert said that ultrasonic inspection at the time the forging was made—1951—pointed to now-known faults inside the low-pressure turbine spindle shaft. Although ultrasonic tests were specified as part of the inspection procedure to be applied to the spindle forging, results were to be used for information only and not as a basis for acceptance or rejection of the forging. This was normal procedure at the time the forging was ordered, because of general lack of experience with the method.

Ultrasonic tests disclosed a general area within the main body in which sonic indications were found, varying from very small to somewhat over 100% of the back reflection. In view of other tests and inspections which were satisfactory, however, the sonic indications in the main body were considered to be caused by inclusions and stringers of a harmless nature.

Investigations subsequent to the failure showed the presence of a large number of cracks in an area extending from near the bore out to approximately mid-radius. They were several inches in length and longitudinal in direction. It was evident that the forging contained a typical flake or thermal-crack pattern.

Magnetic-particle tests of the fatigue-crack area showed the presence of numerous flakes in and around the cracks, some lying at the fatigue-crack initiating points as determined by "beach marks" on the surfaces. It can only be concluded, said the speaker, that the fatigue cracks started from a flake and would not have appeared at all in the absence of this initiating fault. A complete sonic test of one of the burst spindle quadrants showed the pressure of numerous indications, with general pattern and magnitude very similar to those recorded in the initial tests of the rough-machined forging.

A study of the sequence of failure has indicated that it originated deep in the mass of the main body of the spindle shaft. Metallurgical examinations on the remaining pieces have confirmed the fact that the metal was notch-sensitive and susceptible to brittle failure.

Various inspection techniques indicate the presence of an overabundance of cracks in the form of hydrogen flakes, providing the notches necessary to trigger a sudden and catastrophic failure of the shaft.

Since 1951, Emmert concluded, ultrasonic inspection has become our most important tool for the interior examination of metal masses, and we are continually amassing increasing knowledge enabling better interpretation of test results. Sonic testing is very sensitive, and interpretation requires a considerable amount of background experience because it is frequently difficult to distinguish between harmless types of discontinuities and dangerous flake conditions.

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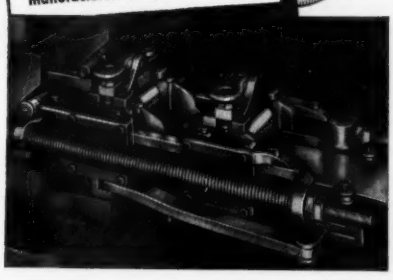

CIRCLE INFORM-A-GRAM KEY NO. 1731

INTEREST INDICATES ASTE TOOL SHOW TO BE BIGGEST YET

Unprecedented interest in tool engineering advances has resulted in record-breaking demand for exhibit space at the 1956 Industrial Exposition, sponsored by the American Society of Tool Engineers and scheduled for Chicago's International Amphitheatre, Mar. 19-23, report show officials.

"With applications for space still coming in more than a month after the original area allotted to exhibits was sold out, we were forced to open the Amphitheatre's North Hall to take care of the rapidly growing waiting list," Harry E. Conrad, ASTE Executive Secretary, said in outlining Exposition details. "Exhibitors have requested more space this year than in any previous show with the increase averaging 12% per exhibitor," he said.

Opening of the new hall makes the 1956 Tool Show the largest ever held in the more than 18 years ASTE has been staging its expositions for industry. More than 40,000 registrants are anticipated, according to Conrad.

New developments to be shown will carry out the "Tooling for Tomorrow" theme and include the latest ideas in cutting tools, ultra-fast and extreme precision machine tools and accessories, processes, and workholding devices.

Numerous technical conferences and panel discussions will feature some of the nation's outstanding experts in the fields of automation, precision control, plant management, cutting, grinding, and other phases of manufacturing. Some 26 conferences and panel discussions are planned.

The technical program topics cover a broad range of new manufacturing practices, research, and development. Included among the subjects will be latest developments in the use of ceramic cutting tools, the new "wonder" materials which may boost cutting speeds to 7,000 sfpm.

Plastic tooling, ever increasing in diversity of applications, will be covered by four top industry experts. Practical and proven uses as well as new materials and methods are to be discussed.

Two papers will outline the uses of a new automation tool for tool engineers — the electronic calculator. Almost any sequence of machining operations can be fed or "programmed" into these units, which then will automatically control the machine to produce a finished part.

The Diamond Symposium, cosponsored by Armour Research Foundation of Illinois Institute of Technology, will shed new light on possible applications of diamonds in industry as well as present actual experience with diamonds in production in the U. S. and other countries. A complete shop actually producing diamond tools will be in operation there.

Other subjects to be covered by technical papers and panel discussions include new developments in grinding, automating individual machines, carbide dies, fine pitch gear production, jig and fixture design, fluid power, cost reduction through product and tool maintenance analysis, and tooling the world's largest presses.

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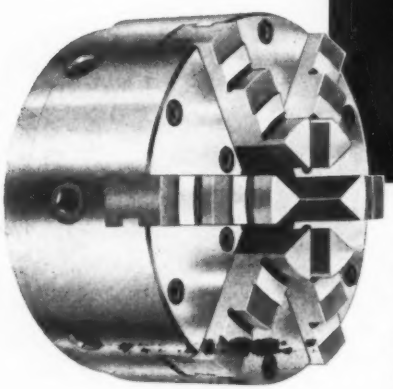

The Buck is the *original precision scroll chuck,* and the 6-jaw design was truly revolutionary.

It has been so successful others have copied its appearance and attempted to copy its performance. As might be expected the substitutes don't measure up to the original Buck.

It means that 6 jaws are no longer the distinguishing hallmark of the Buck. You have to look *twice*, when you buy, to make sure you are getting a Buck to get the maximum savings in costly machinists' time plus the construction that guarantees long accurate service. Your Buck distributor will gladly point out the Buck advantages. Catalog gladly sent on request.

How To Make Sure It's A Buck Chuck

Most Buck chucks carry a nameplate reading "Ajust-Tru." An even more distinguishing feature are the 12 cap screws that hold the chuck and the chuck adapter together. These 12 large screws are also an indication of the durable, rugged construction of the Buck. Keep them in mind when you buy.

Buck chucks come in 6, 3, and 2 jaws—adaptable to lathes, grinders, dividing heads, and screw machines. Sizes from 4″ to 9″.

BUCK TOOL COMPANY

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CIRCLE INFORM-A-GRAM KEY NO. 1741

HIGH SPEED POWER BRUSH DEBURRING

An important addition to automated production lines is a new deburring machine designed with a capacity to debur 200 multi-slitted, broached parts in one hour.

An operator places the gear or part on an expanding collet which holds it in place while it moves around an automatic indexing table. The part travels through five brushing stations and is indexed into four different positions, thus presenting all sides of the chucked part to the brushes for the proper length of time. Since every part bears against the brush with the same amount of pressure, uniform and consistent results are obtained.

The machine, developed by the Fuller Brush Co., Inc., Hartford 2, Conn., uses five Fullanchor brushes, which are wheel brushes made by driving a heavy wire staple through a round steel channel to anchor each tuft individually. These crimped steel wire brushes are 8" dia and revolve at about 3,000 rpm. Their penetration of the work is approximately 0.060". The brushes can be adjusted to compensate for wear by turning hand wheels on each brush station individually. Each brush is driven by a 1-hp motor.

In dry brushing, the metal particles are drawn off by a vacuum system, using hoods about the brushes to carry off the chips.

Each machine is specifically designed to debur a specific type of gear or part. Exhaustive test work is done in the Fuller Brush Application Laboratory to determine the proper brush speeds, material and penetration necessary to do a specific job.

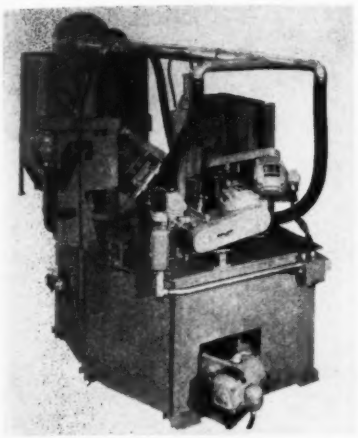

Fig. 1. This automated deburring machine will debur 200 multi-slotted, broached parts in one hr. Part moves around automatic indexing table and passes through five brushing stations so that all sides of the chucked part can be reached by crimped steel wire brushes.

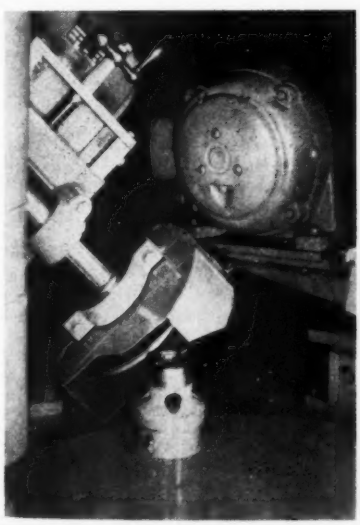

Fig. 2. This close-up of the indexing table shows multi-slotted, broached part at brushing station with crimped steel Fullanchor brush set at proper angle to debur one side of chucked part.

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GOOD MACHINERY SINCE '82

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For Solid Carbide Tools

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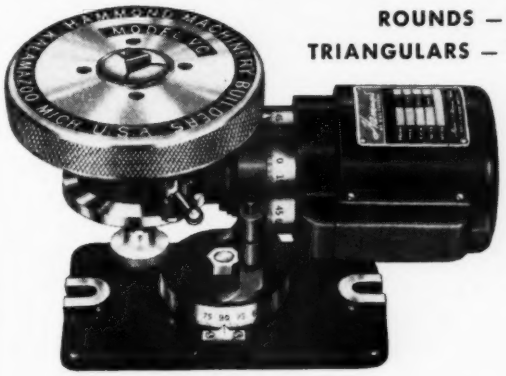
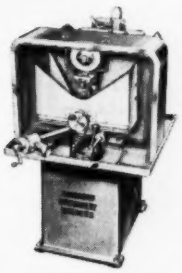
TRIANGULARS — RECTANGULARS



MODEL VC, Style M Motorized Solid Carbide Insert Grinding Fixture. Style H, without motor also available. Write for literature.



THE Hammond Solid Carbide Insert Grinding Fixture pays for itself in a few weeks. Offers a fast, economical and accurate means of grinding chip breaker grooves in round, square, triangular and rectangular shapes and for rough and finish grinding of dull and damaged carbide inserts. Motorized Style M with lug base can be mounted on most tool and surface grinders and Hammond Chip Breaker Grinders.

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CIRCLE INFORM-A-GRAM KEY NO. 1751

TOOL SHARPENING IMPROVED BY METHOD X PROCESS

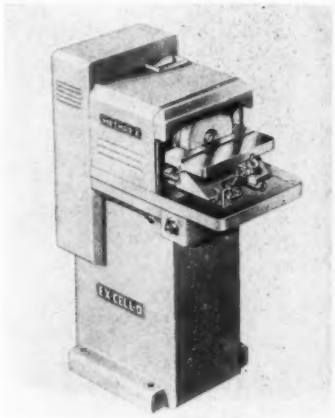
Single point cutting tools are now being efficiently sharpened and modified without diamonds. By an electro spark process, the Method X offhand tool sharpener recently introduced by Firth Sterling, Inc., removes carbide and shank steel simultaneously.

Metal is removed from the tool by an electric spark crossing the gap between (1) a low-cost cast iron wheel acting as an electrode, and (2) the tool, which is separated from the wheel by a semi-solid dielectric film. Because of this film, damage to wheel or tool is impossible and wheel wear is negligible.

The need for diamond or other abrasive grinding is eliminated, thereby effecting greatly reduced tool maintenance costs. Metal removal is usually accomplished in less time than with present conventional methods. Both roughing and finishing are performed on the same wheel eliminating the need for two separate operations.

Field tests have shown that Method X sharpened tools give increased tool performance. The explanation given for this is that resistance to chip flow is greatly reduced, thereby lowering the operating temperature of the tool. Furthermore, there is no thermal shock when servicing tools on the Method X sharpener.

In the plant of a leading machine tool manufacturer, Firthite Grade TX H diamond ground tools were placed on a new J. & L. 15-hp, 16" lathe. The operation consisted of turning three diameters on a SAE 4140 steel forging; average depth of cut was ¼", feed .017" and 250 sfpm. After



turning four pieces, the diamond ground tools were pulling slightly over 16 hp. These tools were removed. Method X sharpened tools of the same grade and style were put into operation with an indicator reading of slightly over 9 hp. After turning 44 complete pieces with an additional tool added to the setup to make a ½" x 45° chamfer, the horsepower indicator showed that 12 hp was being consumed. Chip flow was a great deal more uniform than that produced by the diamond ground tools and the cratering was 30% less.

The research department of a leading equipment manufacturer submitted a report on triangular and square carbide inserts. Those sharpened by the Method X Tool Sharpener performed 100% superior on gray iron with respect to edge wear, than those inserts which were conventionally ground. And the Method X sharpened inserts running on steel performed as well and, in most cases, better.

In another manufacturing plant, E-8 single point tools sharpened by the Method X Tool Sharpener were placed on a Bullard vertical lathe at 260 sfpm, feed .037" and .010/.020" depth of cut in machining a cast iron flywheel. The operation was facing and plunging. Production resulting from the Method X sharpened tools was in ex-

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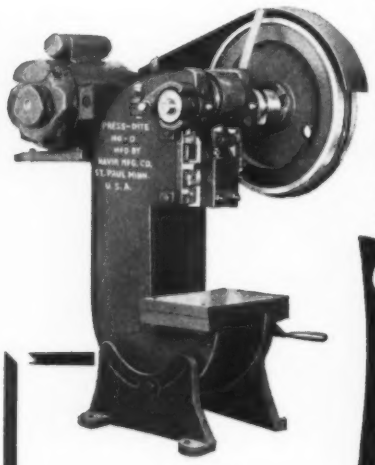

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CIRCLE INFORM-A-GRAM KEY NO. 1761

cess of 85% higher than from those tools ground by diamond wheels. Conventionally ground tools produced 145 average number of pieces per grind and registered an average wear land of .022; whereas Method X sharpened tools increased average number of pieces per sharpening to 225 and the average wear land was only .014.

The Method X tool sharpener was developed by Method X Company, a subsidiary of Firth Sterling, Inc., Pittsburgh 30, Pa. The machine is manufactured by the Ex-Cell-O Corp., Detroit 32, under license from Method X Company. Distribution is being handled by both Firth Sterling and Ex-Cell-O.

Carbide Milling Cutter Failures Often Deceiving

Failure by chipping when using carbides for milling cutters can be deceiving because it may be influenced by operating conditions as well as the condition of the workpiece, Carboloy Department of General Electric Co. in Detroit reports.

Application engineers there point out that there are two basic types of failures of carbide-tipped milling cutters. Tougher or less wear-resistant carbides may fail due to a rapid widening of the wear land. The more wear-resistant carbides may fail by chipping of the cutting edges.

If a cutter is run too long before the cutting edges are inspected, Carboloy says, the wide wear land on the cutting edges may have all indications that a more wear resistant grade of carbide should be used.

Actually, if the cutting edges have been inspected with the aid of a magnifying glass after milling the first piece, or even a partial piece, they would have indicated that cutter failure originated from minute chipping of the cutting edge. Instead of using a more wear-resistant carbide to eliminate the trouble, the next less wear-resistant or tougher grade of carbide should be used.

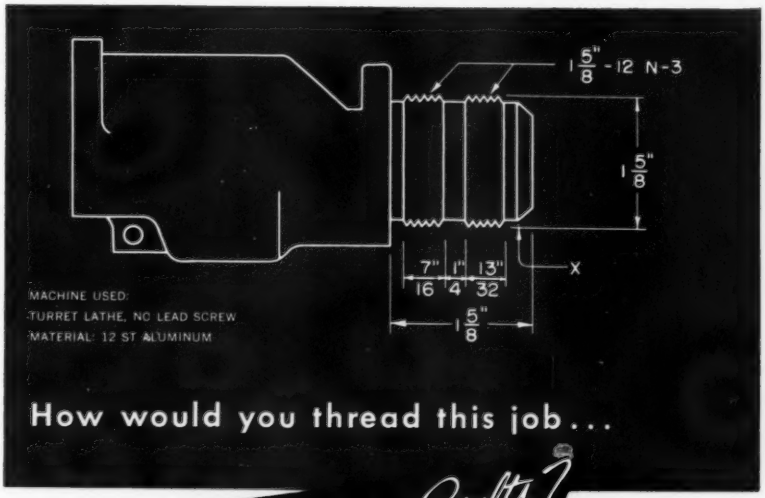
According to Carboloy's application engineers, there also is a tendency on the part of milling cutter users, in many instances, to increase the cutter speed by a considerable amount when a lighter feed per tooth is being used. It is found, however, that cutter life may be improved under such conditions if only the feed per tooth is reduced — without making any change in the cutter speed.

SAE Picks Delaney as '56 President

George A. Delaney, chief engineer of GM's Pontiac Motor Division, took office at the annual SAE meeting in Detroit as 1956 president of the Society of Automotive Engineers. He succeeds C. G. A. Rosen, consulting engineer to the president of Caterpillar Tractor Co.

Long active in the SAE, Delaney has contributed to the Society's growth as a member and chairman of the Society's Technical Board and other important posts.

The new SAE president became chief engineer at Pontiac in 1946, having started there as electrical engineer in 1934 and moving to the position of assistant chief engineer in 1939. During World War II Delaney supervised aircraft engineering at GM's Fisher Body Division.



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It takes J & L accuracy with "no approximations" to guarantee Class III results, not sometimes, but every time. And chaser resharpening is controlled too.

THE RESULTS: Exceptionally fine finish. The ¼" undercut between threads is turned after threading. More than 3,600 pieces are threaded to Class III tolerances without resharpening chasers.
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CIRCLE INFORM-A-GRAM KEY NO. 1771

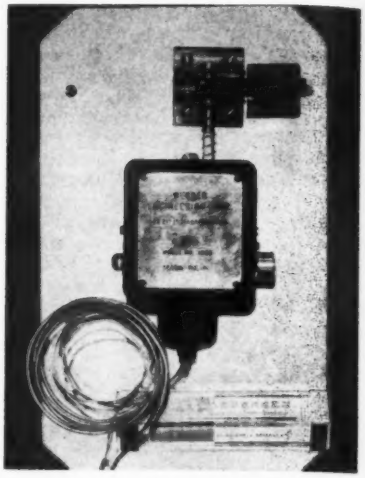
AUTOMATIC LOCK FOR RIVET REFRIGERATORS

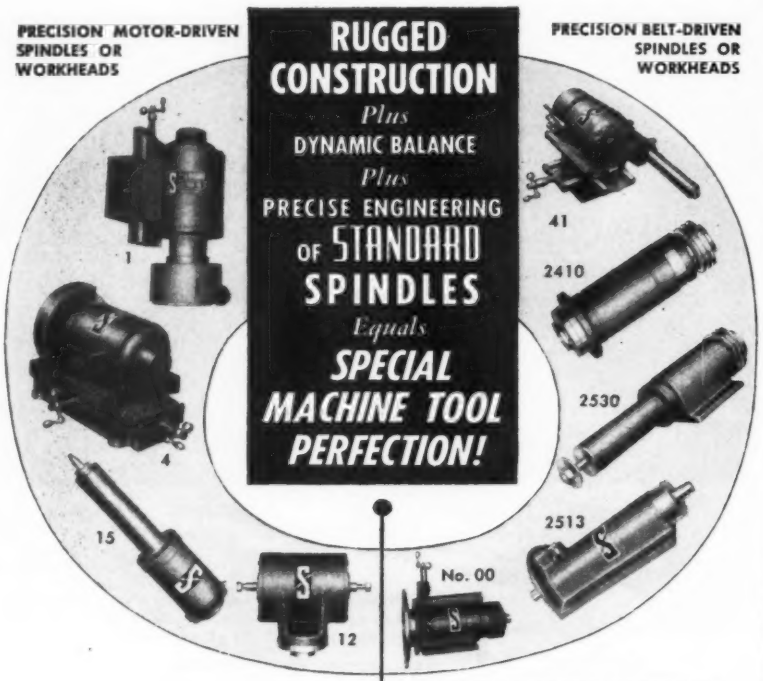
An automatic lock, the positive answer to the control of refrigerated rivet quality, has been developed at the request of Glenn L. Martin manufacturing engineers by the Webber Engineering Corp. of Indianapolis.

The non-electrical thermostatically controlled device locks the refrigerated rivet cabinet when the temperature rises above —10°F for any reason. Only Quality Control inspectors are furnished keys to unlock the cabinet, and they know that any rivets in a cabinet locked by the automatic device are unsuitable for use and must be re-heattreated. No other employee can open the box, even inadvertently.

Settings may be adjusted within wide ranges, but most rivets at Martin are maintained at —20°F, with warming above —10°F a critical condition that warrants discarding or reprocessing the rivets.

It is necessary to refrigerate 23ST aluminum alloy rivets to slow the aging process and keep the metal in a ductile, "as quenched" condition so they can be easily headed. At higher temperatures than —10°F, the metal hardens and may crack during the heading operation. Maximum strength is attained when the rivets are hardened after they have been headed.





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CIRCLE INFORM-A-GRAM KEY NO. 1781

$5-MILLION MARKED FOR BUILDINGS AT ARMOUR RESEARCH

A $5-million building program recently announced in Chicago will give Armour Research Foundation of Illinois Institute of Technology "one of the most complete industrial research centers in the world."

The expansion program, as outlined by Dr. Haldon A. Leedy, Foundation vice president and director, calls for the construction of three buildings and substantial additions to two buildings over the next 10 years.

"The building program is a necessity if Armour Research Foundation is to meet the increasing demand for its industrial research and development services," he stated. ARF expects to have a 50% increase in research volume and personnel within five years.

"The building plans are based on the assumption that the Foundation will have a research volume of $16-million and a staff of 1,600 by 1961," he explained.

New buildings include a Physics and Electrical Engineering Research building to be completed in 1956; Chemistry Research building, 1959; and Administration building, 1966.

Additions to the Mechanical Engineering Research building and Metals Research building are scheduled.

The five construction projects will consolidate, modernize, and enlarge ARF's physical plant, now scattered over 15 buildings on the Illinois Tech campus. When completed, the Foundation's facilities will be concentrated in six buildings in a two block area.

Leedy reported that the Foundation's research volume surpassed the $10-million mark for the third consecutive time during the 1955 fiscal year.

"It also was a year in which ARF performed research and development in connection with more industrial projects than ever before — a record 342. In addition, the Foundation handled 170 projects for the government."

In reviewing the year, Leedy said outstanding contributions were made by ARF in such varied fields as titanium alloys, aerosol technology, blast protection, and ceramic coatings.

Milling Machine Converted for Jig Boring

Many vertical milling machines can readily be converted for precise jig boring operations by the application of a linear Inductosyn for micro positioning and automatic control.

The system provides for control of X and Y axes by the Inductosyn elements mounted along the table and cross slides of the miller, which are electronically actuated by a push button keyboard input control for X and Y positioning with a program drum providing for automatic operation of 15 positions.

The Inductosyn consists of precisely spaced metallic conductors on glass plates, comprising circuit elements, a scale which is attached to a stationary part of the machine, and a slider carried by the moving part. Inasmuch as these elements are mounted directly on the machine, errors due to lead screws, rack and pinions, or gear trains are completely eliminated. Measurements are always referenced to an established zero reference, thereby also eliminating accumulative errors.

The work performed on this machine consists of automatic sequential operations comprising boring and reaming of precisely located holes. While the inherent accuracy of the Inductosyn is 0.0001" with repeatability of 25 micro-inches, the accuracy of a machine equipped with Inductosyn is limited by the stability of the carriage, slides, etc., and the precision of the ways. In this application of Inductosyn to an obsolete model milling machine, an overall boring accuracy of 0.0005" center to center resulted.

Although in this instance, a keyboard and program drum input control is utilized, operation from punched cards, punched tape, magnetic tape, etc., can be provided.

The Inductosyn equipment, built by Farrand Controls, Inc., 4401 Bronx Blvd., New York 10, N. Y., can be applied to any number of linear and rotary axes and programmed for either simultaneous or sequential operations.

The Inductosyn system for automatic positioning control or numerically controlled contour machining can be applied to machine tools of various types and sizes such as drill presses, boring machines, milling machines, grinders, jig borers, gear cutters, lathes, etc.

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CIRCLE INFORM-A-GRAM KEY NO. 1791

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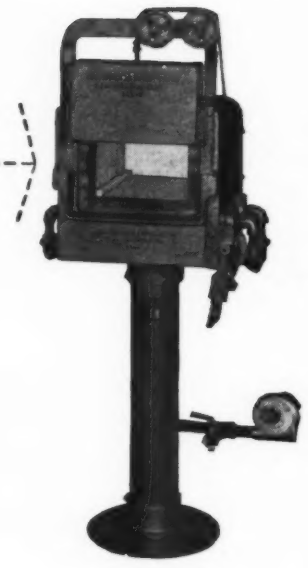

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CIRCLE INFORM-A-GRAM KEY NO. 1801

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The Editors

Tooling & Production

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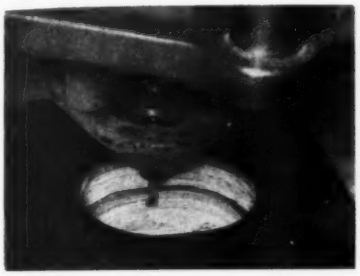
CIRCLE INFORM-A-GRAM KEY NO. 1802

Routing Dissimilar Materials with Carbide Cutters

Martin Aircraft of Baltimore has designed a solid carbide cutter which successfully routs panel cutouts of many different combinations of materials used in today's aircraft. Previously, combinations of many dissimilar materials such as metal honeycomb, phenolic fiber, fiber glass and dural, meant the rapid breakdown of high-speed steel routing cutters.



The new Martin solid carbide cutter has successfully routed over 500 cutouts in panels of laminated phenol-fiber, fiber glass and dural, and shows no sign of breakdown. Previously, high-speed steel cutters failed after routing two cutouts.

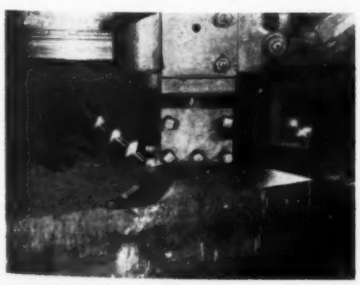
Emergency Carbide Tooling Involves Four Jump Cuts

Problems in metal cutting multiply when a 7-ton SAE 2030 steel bolster plate that measures 7" x 72" x 96" must be faced on a boring mill — and there are four jump cuts!

This was the predicament facing a machine tool manufacturer when a shop emergency made it necessary to machine flame-cut plates on a boring mill instead of on a twin-cut milling machine as was the general practice.

To provide rapid metal removal, the operator of the Cincinnati Hypro 50-hp boring mill modified the Grade K21 insert of a standard Kennametal clamped tool style BRH32, made by Kennametal Inc., Latrobe, Pa.

The long lead angle, combined with a feed of .062" per revolution, produced a thin, wide, clean chip. This chip was made at 380 sfpm — across corners of the workpiece — with a cut 5/16" deep.



The cutting insert, Grade K21, so completely withstood repeated jump cut shock that regrinding was only needed when bolster plates were changed in the boring mill.

In contrast, the production report comments that previous attempts to face the plates with tools of other materials ended with fractured inserts due to the severe interrupted cut.

According to the manufacturer, the metal removal rate in the boring mill should have compared favorably with that normal in the milling machine. But, it was necessary to change to a high speed steel tool at the center of the bolster plate where the sfpm became too low for efficient and economical use of a sintered carbide tool.

to economize
STANDARDIZE *with* RING

precision PUNCHES and DIES

Ring Standardized Punches and Dies offer cost saving dependable performance for all of your perforating problems.

Precision volume production to rigid specifications offers

- ★ Low cost
- ★ Complete interchangeability
- ★ Immediate shipments from stock on Standards plus prompt delivery on Specials
- ★ High quality — long life

MANY SHAPES AND TYPES

Blanks — Pilots — Headless — Shoulder and Bevel Head Quills — Slug Ejector Punches — Transfer Punches

NEW! → Tough — Accurate Retainers for Ring Punches and Dies mount easily to your die set. Available in Key Type for irregular shapes.

WRITE FOR OUR ILLUSTRATED CATALOG

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25 FENTON PLACE
JAMESTOWN, N.Y.

Gentlemen: Please send me a copy of your new, complete CATALOG #104 at once.

NAME_____
COMPANY_____
ADDRESS_____
CITY_____ ZONE____ STATE_____

CIRCLE INFORM-A-GRAM KEY NO. 1811

Kling Bros. Engineering Works has named **Joseph M. Dorocke** general sales manager. In addition to his sales management duties, he'll supervise sales policies and sales promotion.

George W. Crawford will take over as assistant sales manager for Punch Products Corp. Before joining the company, he had been customer service manager for 10 years for the Wales-Strippit Corp. Mr. Crawford will be located at the firm's general offices in Niagara Falls, N. Y.

◆

William H. Baudouine will take over as sales manager of the abrasives, div'n of Elgin National Watch Co. He'll direct national sales of diamond abrasives, carbide rotary tools, and "Elgiloy", non-corrosive spring material.

LOOK AT THIS UP-TO-THE-MINUTE EXHIBIT OF

POPE PRECISION SPINDLES

EXHIBIT A

POPE SUPER-PRECISION, HEAVY DUTY BORING SPINDLES for boring holes round within millionths of an inch. Available in both belt driven and motorized units to meet a wide range of speeds and horsepower. Send us your specifications for quotations.

EXHIBIT B

POPE 1 HP, TOTALLY ENCLOSED 3600 RPM MOTORIZED, CARTRIDGE TYPE PRECISION SPINDLES with double row cylindrical roller bearings and separate thrust bearings for no endwise movement of the shaft

EXHIBIT C

NEW POPE QUICK, SELF-REMOVING WHEEL HOLDER for surface grinders and tool and cutter grinders — eliminates the necessity of a wheel puller. Write for quotations.

EXHIBIT D

POPE HEAVY DUTY, ¾ TO 100 HP DIRECT MOTORIZED SPINDLES for Horizontal or Vertical Skin Milling, Grinding, Milling, Boring and Other Operations

EXHIBIT E

POPE SUPER-PRECISION MOTORIZED TOOL AND CUTTER GRINDER SPINDLES with clearance Angle Swiveling Heads for Angular Adjustment In A Vertical Plane

EXHIBIT F

POPE HEAVY DUTY VEE-BELT DRIVEN, PRECISION MILLING SPINDLES, and Wheel Heads, ½ to 50 HP

EXHIBIT G

POPE INTERNAL GRINDING SPINDLES for Bryant, Excello, Heald and Landis Grinders.

EXHIBIT H

POPE SUPER-PRECISION HIGH FREQUENCY HEAVY DUTY GRINDING AND MILLING SPINDLES for speeds up to 100,000 RPM

WRITE FOR COMPLETE SPECIFICATIONS, PRICE AND DELIVERY

No. 107

Specify POPE PRECISION SPINDLES

POPE MACHINERY CORPORATION
Established 1920
261 RIVER STREET · HAVERHILL, MASSACHUSETTS

CIRCLE INFORM-A-GRAM KEY NO. 1821

Three new field staff assignments have been announced by The Warner & Swasey Co. **D. J. Ubersax** is a field engineer for the New England sales office, **David McClure** at the Houston office, and **George Gleiss** is serving the Chicago area.

◆

Clifford A. Brooks has been named advertising manager for Pratt & Whitney Co., Inc. **Stanley E. Huffman, Jr.** has been appointed district manager of the company's Rochester office according to an announcement by **A. H. d'Arcambal.** The new sales representative for the Rochester district will be **Laurence D. Gillane.** He will have his headquarters in Syracuse.

◆

Richard C. Bannon has been made general sales manager for Waterbury Farrel Foundry and Machine Co. He is also vice president and a director of the company.

◆

Morton B. Gilbert has joined the Chicago district staff of F. J. Stokes Machine Co. as a sales engineer.

◆

Two new district managers have been named to head sales offices of Vanadium-Alloys Steel Co. **R. D. Bardes** will be in charge of the St. Louis district and **Charles A. Lundy** of the Cincinnati territory.

◆

Whitman & Barnes has appointed **William Killion** sales engineer in North and South Carolina and eastern Tennessee.

◆

Peter N. McSherry, Jr. has been promoted to sales manager of the socket screw div'n of The Bristol Co., according to an announcement by H. E. Beane, vice president-sales.

◆

George J. Vosatka will manage the newly opened Pacific Northwestern sales and service headquarters of ElectroData Corp. The regional office, which will be in Seattle, will provide technical and consulting services for users of the company's electronic data processing machines.

◆

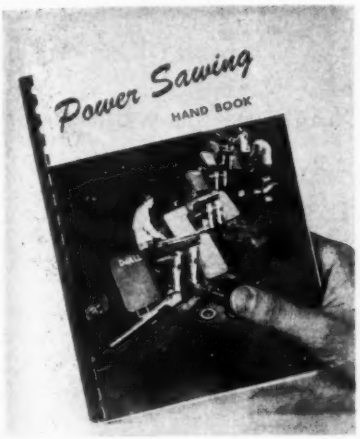
Adamas Carbide Corp. has appointed **Clark B. Frothingham** district sales manager for the northern Illinois territory. He'll handle the company's line of tungsten carbide tools, tool tips, dies, and wear parts.

◆

A. E. Baldwin will be in charge of the Texas, Louisiana, and Arkansas territories for Chicago-Latrobe. **John R. Roberts** has joined the sales staff at the company's Chicago office. The company has appointed **Andrew Welch** as sales and service representative of the Hartford metropolitan and the southern New England territory.

"Power Sawing Handbook" summarizes cut-off techniques. Long standing misconceptions are exposed and eliminated, and correct approaches to cut-off problems are suggested.

This thorough, concise, 108-page pocket-size handbook provides information on neglected subjects as "How to Estimate Cut-Off Costs". It examines and analyzes every major factor contributing to the total cost per cut and gives a procedure for using them in calculating the cost. Such data is of value to tool engineers and production and methods men.



One chapter deals with the significance of high-speed steel in its new form as a flexible saw band. Another section covers the origin and development of the saw.

The book ends with a discussion of the characteristics of commercial steels. It gives recommendations for cutting these metals on the new automatic power saw.

The DoAll Co., Des Plaines, Ill., will comply with letterhead requests for this book.

Ludlow King is Assistant to NMTBA's Berna

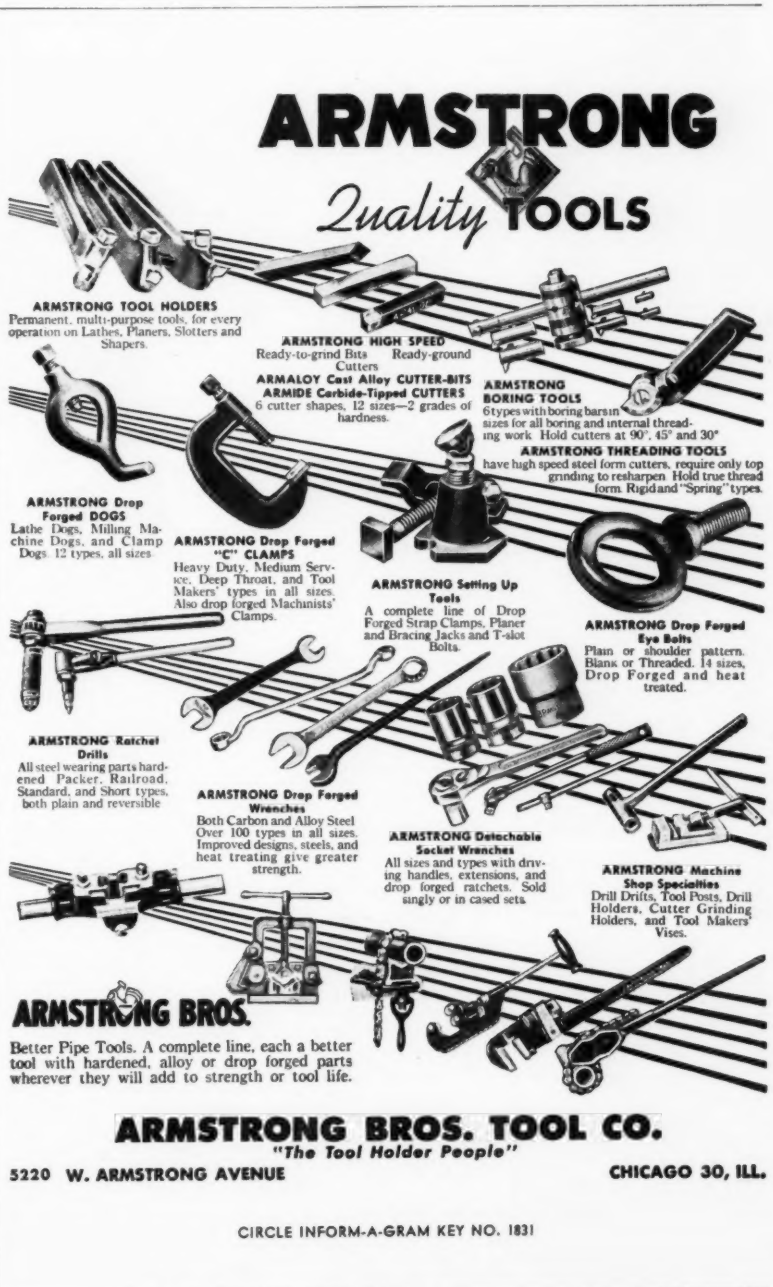
The addition of Ludlow King to the staff of the National Machine Tool Builders' Association as assistant to Tell Berna, its executive vice president, was announced recently by Louis Polk, NMTBA president.

King, who is a native of Oklahoma, was graduated from West Point in 1930. Following engineering experience in the Oklahoma oil fields he held sales positions for Great Western Sugar Co. and Owens Illinois Glass Co.

In World War II, he was a Lieutenant Colonel in the Army Chemical Corps. Relieved of active duty, King joined Owens-Corning Fiber-Glas Corp. as Washington branch manager and then Manager of Services to the Federal Government.

During his eight years in Washington in this capacity he became the first elected president of the Armed Forces Chemical Association. He also served as Chairman of the Coordinating Committee of the Armed Forces Associations, arranging industry-Armed Forces conferences throughout the country, and as president of the American Ordnance Association, Washington Post.

In March 1952, King became vice president of the Plastics division of the Universal Moulded Products Corp. of Philadelphia, with headquarters in Washington.


ARMSTRONG
Quality TOOLS
ARMSTRONG TOOL HOLDERS
Permanent, multi-purpose tools, for every operation on Lathes, Planers, Slotters and Shapers.
ARMSTRONG HIGH SPEED
Ready-to-grind Bits Ready-ground Cutters
ARMALOY Cast Alloy CUTTER-BITS
ARMIDE Carbide-Tipped CUTTERS
6 cutter shapes, 12 sizes—2 grades of hardness.
ARMSTRONG BORING TOOLS
6 types with boring bars in sizes for all boring and internal threading work. Hold cutters at 90°, 45° and 30°
ARMSTRONG THREADING TOOLS
have high speed steel form cutters, require only top grinding to resharpen. Hold true thread form. Rigid and "Spring" types.
ARMSTRONG Drop Forged DOGS
Lathe Dogs, Milling Machine Dogs, and Clamp Dogs 12 types, all sizes
ARMSTRONG Drop Forged "C" CLAMPS
Heavy Duty, Medium Service, Deep Throat, and Tool Makers' types in all sizes. Also drop forged Machinists' Clamps.
ARMSTRONG Setting Up Tools
A complete line of Drop Forged Strap Clamps, Planer and Bracing Jacks and T-slot Bolts.
ARMSTRONG Drop Forged Eye Bolts
Plain or shoulder pattern. Blank or Threaded. 14 sizes, Drop Forged and heat treated.
ARMSTRONG Ratchet Drills
All steel wearing parts hardened. Packer, Railroad, Standard, and Short types, both plain and reversible
ARMSTRONG Drop Forged Wrenches
Both Carbon and Alloy Steel Over 100 types in all sizes. Improved designs, steels, and heat treating give greater strength.
ARMSTRONG Detachable Socket Wrenches
All sizes and types with driving handles, extensions, and drop forged ratchets. Sold singly or in cased sets.
ARMSTRONG Machine Shop Specialties
Drill Drifts, Tool Posts, Drill Holders, Cutter Grinding Holders, and Tool Makers' Vises.
ARMSTRONG BROS.
Better Pipe Tools. A complete line, each a better tool with hardened, alloy or drop forged parts wherever they will add to strength or tool life.

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
5220 W. ARMSTRONG AVENUE CHICAGO 30, ILL.

CIRCLE INFORM-A-GRAM KEY NO. 1831

LAYOUT FLUID
FOR ANY METAL

Send for FREE SAMPLE

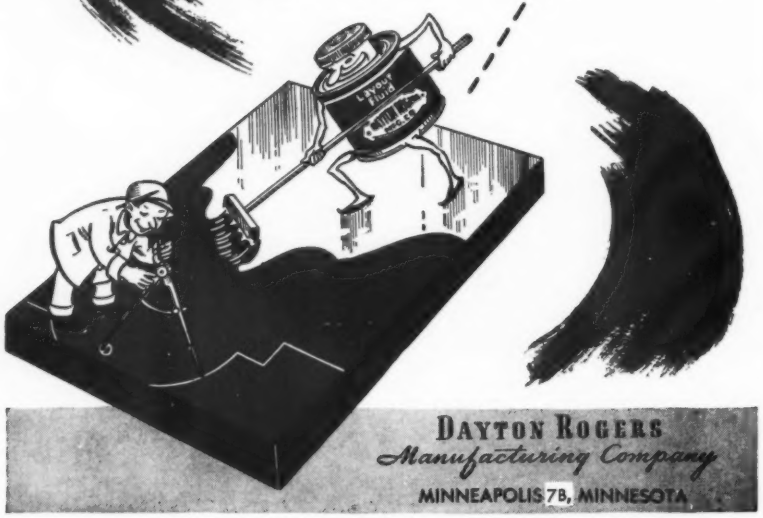
Your local supply house carries Dayton Rogers', Layout Fluid.

Applicable to all metal. One merely wipes the surface clean and then brushes on the Layout Fluid.

Dries Instantly. No waste. Scribed lines are pronounced and contrast to the dark blue background, thus relieving eyestrain.

Assures greater accuracy and speeds up work. You will save time and money on all layout jobs.

A sample is waiting for you. Send for it today.



DAYTON ROGERS
Manufacturing Company
MINNEAPOLIS 7B, MINNESOTA

CIRCLE INFORM-A-GRAM KEY NO. 1841

WE of WOODSON TOOL CO.

are using this opportunity to express gratitude to you of the metal cutting industry for your acceptance of Micro Miniature End Mills over the past decade.

Woodson Tool Co. pioneered the manufacture of very small end mills using "ground-from-the-solid-after-heat-treatment" methods. Those methods and principles proved to be sound.

In the decade since then Micro Miniatures gained a reputation for outstanding quality. We are proud of that reputation and of our trade mark that stands for quality, precision and service.

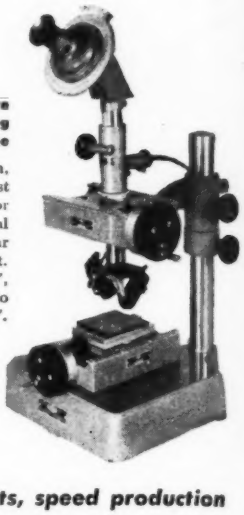
We intend to maintain and build our reputation further in the years to come.

Again THANK YOU.

When you think of small END MILLS — think of MICRO MINIATURES

WOODSON TOOL CO. 4811 Lennox Blvd. Inglewood, Calif.

CIRCLE INFORM-A-GRAM KEY NO. 1842



Coordinate Measuring Microscope

High precision, low cost instrument for 2-dimensional linear measurement. Range 2" x 2", reading to 0.0001".

Cut rejects, speed production

Fast, reliable readings to 0.0001" with Gaertner measuring microscopes

Precise, versatile, easy-to-use Gaertner measuring microscopes assure positive, direct measurement of precision parts. You see clear, sharply-defined images. No physical contact to distort or injure object being measured. Enjoy new production savings with Gaertner optical instrumentation. Write for complete data on the Gaertner line of industrial microscopes.

Toolmakers' Microscope

Ultimate in measuring microscopes. Range 2" x 4", reading to 0.0001", angular measurement to 1 minute.

Micrometer Slide Comparator

Reliable, low cost instrument for linear measurement. Ranges up to 4", reading to 0.0001" or 0.00005".

Filar Micrometer Microscope

High quality, low cost instrument for extremely precise measurements. Range 0.08", reading to 0.00002".

Write for Bulletin 161-54 showing applications, models, specifications.

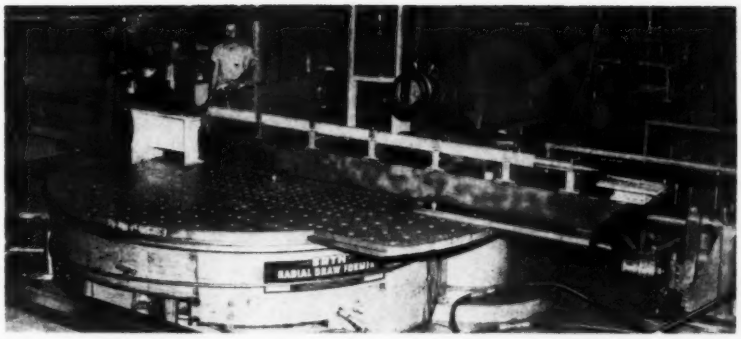
The Gaertner Scientific Corporation
1242 Wrightwood Ave., Chicago 14, Ill.
Telephone: BUckingham 1-5335

CIRCLE INFORM-A-GRAM KEY NO. 1843

DRAW FORMER USED TO DO BROACHING

A Cyril Bath draw former does internal broaching on a 9' aluminum tube at Chance Vought Aircraft in Dallas. Tool research engineers there decided on the machine when they found the tube was too long for a broaching machine table. The danger attendant with rapid starting and stopping of its bed ruled out a long planer.

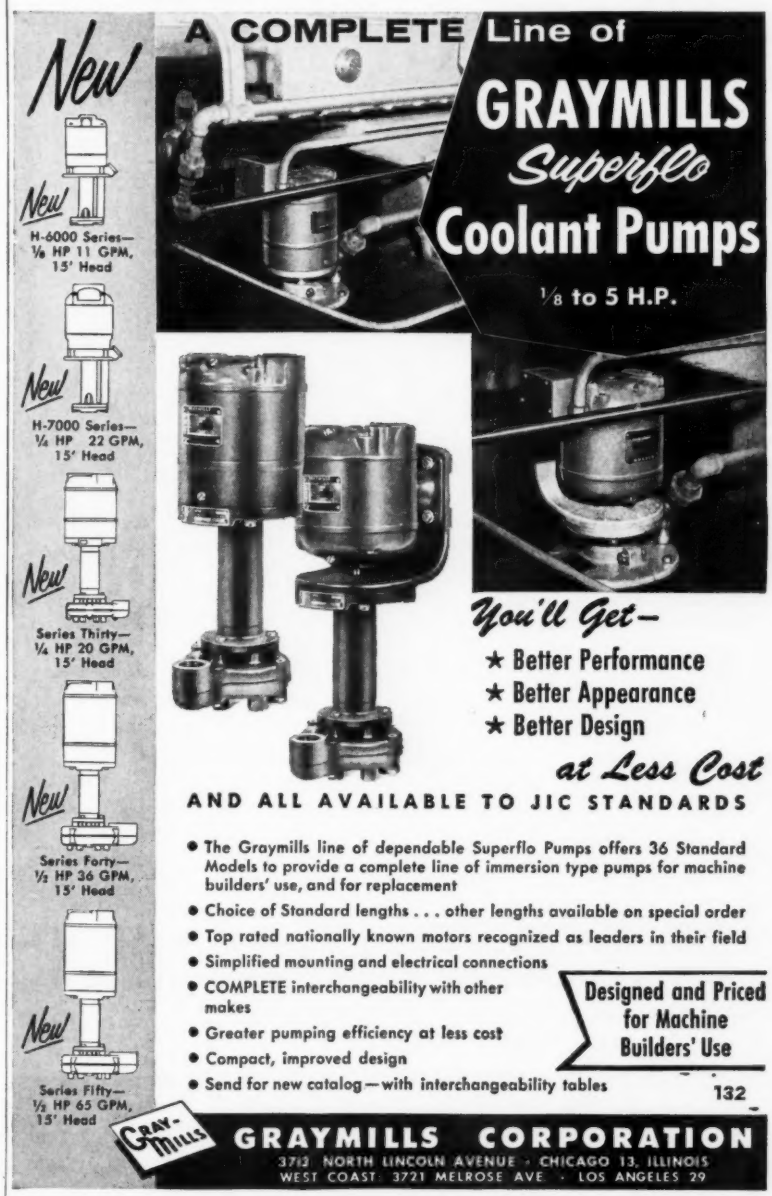
To do the job, a draw rod about 10' long was attached to a mandrel containing three broaches and three floating wear plates. This rod was attached to the 25-ton draw head. The aluminum tube was clamped into a fixture and the broach was pulled through slowly five times to make the required .030" to .060" cuts down the internal ridges of the aluminum tube.



Hammond Machinery Builders, Inc. has purchased the line of Grand Rapids drill and tap grinders from Gallmeyer & Livingston Co.

Above is one of the Gallmeyer & Livingston tap grinders manufactured by Hammond Machinery Builders, Inc.

The Inform-A-Gram Card Page 124.1 is for your Convenience in Making Inquiries


New
New
H-6000 Series—
⅛ HP 11 GPM,
15' Head
New
H-7000 Series—
¼ HP 22 GPM,
15' Head
New
Series Thirty—
¼ HP 20 GPM,
15' Head
New
Series Forty—
½ HP 36 GPM,
15' Head
New
Series Fifty—
½ HP 65 GPM,
15' Head
A COMPLETE Line of
GRAYMILLS
Superflo
Coolant Pumps
⅛ to 5 H.P.
You'll Get—
★ Better Performance
★ Better Appearance
★ Better Design
at Less Cost
AND ALL AVAILABLE TO JIC STANDARDS
• The Graymills line of dependable Superflo Pumps offers 36 Standard Models to provide a complete line of immersion type pumps for machine builders' use, and for replacement
• Choice of Standard lengths . . . other lengths available on special order
• Top rated nationally known motors recognized as leaders in their field
• Simplified mounting and electrical connections
• COMPLETE interchangeability with other makes
• Greater pumping efficiency at less cost
• Compact, improved design
• Send for new catalog—with interchangeability tables
Designed and Priced for Machine Builders' Use
132
GRAY-MILLS
GRAYMILLS CORPORATION
3712 NORTH LINCOLN AVENUE · CHICAGO 13, ILLINOIS
WEST COAST: 3721 MELROSE AVE · LOS ANGELES 29

CIRCLE INFORM-A-GRAM KEY NO. 1851

WHAT DOES A BEARING RACE SOUND LIKE?

A precision testing machine has been developed which measures surface waviness around ball and roller bearing races and other surfaces of rotation by translating surface "waves" into two meter readings and into sound. An experienced operator can actually hear whether a part meets micro-inch waviness tolerances by the sound it produces on this Wavometer.

A key precision feature of the Wavometer manufactured by Micrometrical Manufacturing Co., Ann Arbor, Mich., is a vibration-free motor-driven spindle, which rotates the part that is being tested. An electromagnetic transducer (tracer) is applied to the part, producing an electric voltage that is proportional to the waves around the circumference. This voltage is transmitted to (1) two dials scaled in microinches, which indicate the average height of the waves, (2) a loudspeaker system, which converts the waves into sounds of different frequencies, depending on the surface, and (3) an oscilloscope, a small screen which presents surface characteristics in a visible line.

Due to the extremely close tolerance of the spindle and its inaccessibility under the instrument housing, Micrometrical has made automatic lubrication a standard feature for this part of the instrument. An automatic lubricator, manufactured by Bijur Lubricating Corp. of Rochelle Park, N. J., feeds

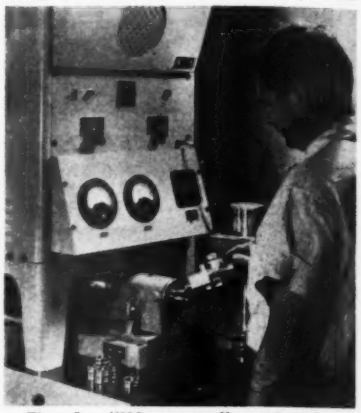


Fig. 1. "Wavometer" testing instrument, for measuring the waviness around surfaces of rotation. Electromagnetic tracer, mounted on pilotor, is applied to the part under test, which is rotated on spindle.

controlled amounts of oil on a predetermined time cycle to two bearings that are fitted to the spindle for maximum precision. The clearance is so close that a special oil of extremely low viscosity is used; and dependable lubrication is essential in order to prevent "freezing" of the spindle.

Powered by the Wavometer spindle itself, the Bijur lubricator feeds a total of 1 cc of oil per hour to these two points. Standard metering devices, Bijur Meter-Units, filter and measure exact quantities of oil at both points.

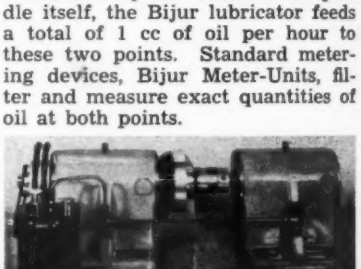


Fig. 2. Bijur lubricating system, which provides controlled periodic lubrication for two precision bearings on the Wavometer's enclosed spindle.

Since the spindle is fully enclosed, the automatic lubricator represents the only way it can be lubricated without stopping the machine. Precision of the spindle is protected by the lubrication control afforded by the Meter-Units. And the Wavometer's only lubrication maintenance consists of a periodic check and filling of the one-pint reservoir.

Here's NEW VERSATILITY

at a NEW LOW PRICE

Profilometer®
GROUP II
with the new TYPE LJ TRACER

● MEASURES ON ID's as small as ¼", OD's as small as ⅛", flats, tapers, narrow splines — in microinches (arithmetical or r.m.s. average). Measures ALL surfaces in many plants.

● DEPENDABLY ACCURATE. Meets or exceeds all ASA requirements. Simple to use, and tamperproof; no calibration by the operator. Built for continuous shop use.

● COMPLETE as shown — $1295.00.

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THE PROFILOMETER — First in roughness measurement, since 1936.

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MMC MICROMETRICAL MANUFACTURING COMPANY

339 S. MAIN ST. ANN ARBOR, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1861

At Your SERVICE

Playing a significant role in what is proving to be one of the most important recent developments in the fabrication of airframes, United States Chemical Milling Corp. of Los Angeles has engineered a streamlined production procedure to handle large volume requirements for chemically milled parts. The company's production capacity for subcontracting is sufficiently flexible to meet most manufacturers' requirements.

Linconditioning Division of the Lincoln Electric Co., Cleveland, remanufactures old welders on a production line basis. The service gained in popularity by a 45% increase in output last year, some of which was due to increased interest in preventive maintenance in plants throughout the country.

Wide aluminum extrusions are about to invade some new markets, says Harvey Aluminum, Torrence, Calif. Because of their design versatility and functional adaptability, the company is recommending the wide extrusions for redesigning numerous existing structures and structural sections.

CREDIT LINES . . . .

W. B. DUNCAN, Wesson Company board chairman and author of this month's lead article, "Looking Ahead in Carbide Tooling," is a University of Pittsburgh graduate. He joined Wesson in 1941 as president of Wesson Tool Co., following several years as assistant to the president of Chicago Latrobe. Since 1954 he has been chairman of the entire Wesson organization which includes seven firms in Michigan, Kentucky, and Ontario, Canada.

In last February's 6th Annual Carbide Feature Issue, Carboloy's FRED LUCHT told about trepanning with carbides on existing machine tools. This issue's contribution is a sequel to that article, and indirectly to his earlier article, "The ABC's of Trepanning." This one covers methods of trepanning non-rotatable — very large or irregularly shaped — workpieces. A design and application engineer, Mr. Lucht's comprehensive articles in TOOLING & PRODUCTION since 1948 on both drilling and trepanning have attracted wide reader interest.

Another repeater from last year's Carbide Feature Issue, A. F. STEVENS, gives information on a subject he knows well. As chief metallurgical engineer at Valenite Metals Corp., he is well aware of the processes involved in producing high grade carbide preformed parts and also of the importance of knowing about some of the limitations in the design and use of preformed carbides. As an expert in the carbide field, Mr. Stevens surely is an ideal choice as author of this issue's "Getting Maximum Economy from Preformed Carbide Parts."

W. M. HALLIDAY is no stranger to TOOLING & PRODUCTION, although he lives thousands of miles away in Southport, Lancaster, England, and has never personally met T & P's editors. His accurately presented technical articles since 1954 include: "Relationship of Piercing Punch Size to Stock Thickness," "Arbor Automatically Locates Parts," and "Three Designs for Spring-Loaded Stock Guides." Part I of "Machining Work-Hardened Alloy Steels" appeared last month; Part II is in this issue.

BRYANT GROOVE GAGE

One low-cost kit checks all standard grooves through 5"!

- The Bryant groove gage offers incomparable accuracy and speed at low cost. No bearings or slides to wear — (no scissors action).
- Complete kit includes four pairs of segments to check "O" ring grooves through 5" dia. and four pairs of segments to check snap ring grooves through 5" dia. — immediate delivery from stock.

Segments for checking special grooves available.

Bryant bench-type gages to measure internal threads, external threads and squareness of face as well as portable gages for checking internal threads are also available.

Bryant Gage and Spindle Division • Division of Bryant Chucking Grinder Co., Springfield, Vermont, U. S. A.

Bryant Gage and Spindle Division, P. O. Box 620F, Springfield, Vermont, U. S. A.

Gentlemen: Please send me more information on Bryant Gages.

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Cut Die-Making Cost

by reducing set-up time as much as 90%

With Jig Boring Accuracy

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*Proved by actual on-the-job performance

ADVANCE CROSS-SLIDE ROTARY TABLE

permits fast, precise positioning of work-piece from ONE SET-UP. No unclamping and reclamping on your standard vertical mill equipped with ADVANCE Cross-Slide Rotary Table. Only your milling machine's table movement limits the size radius you can cut.

Ideal for tools, dies, jigs, fixtures, gauges, patterns, molds, cams, templates, models and experimental work. Write for specifications and literature today.

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937 West Lake Street, Dept. A, Chicago 7, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1881

ACE SETS THE PACE!

Now Offers You The

LARGEST DELIVERABLE SELECTION

more than 22,000 SIZES, TYPES AND SPECIFICATIONS
A.S.A. & ACE STANDARD DRILL BUSHINGS

Regular, Serrated, Castable, Micro and Super-Sizes . . . plus Specials

Your "Specials" may be ACE "Standards"—ask for them!

***Always Specify* ACE—"STANDARD OF THE INDUSTRY"**

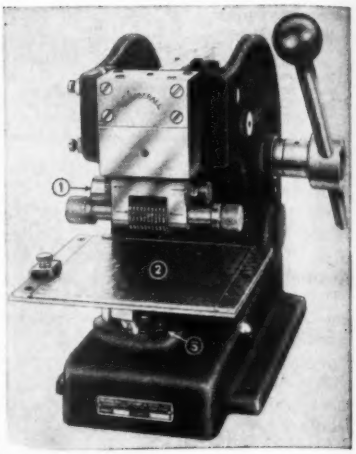
Write For Catalog "F"

ACE DRILL BUSHING CO., INC.
5407 Fountain Ave., Los Angeles 29, Calif.

CIRCLE INFORM-A-GRAM KEY NO. 1882

NEW BENCH NUMBERING PRESS

MODEL 136



This new small, light, compact Press was designed for stamping small Name Plates and small flat articles with up to ⅛" high characters.

It weighs only 65 lbs. yet has the power and strength of a press much larger in size.

Its compactness, and small size, combined with its power, should be very welcome where saving of valuable space and leaving larger power presses free for other work is of importance.

The model 136 is hand operated, using a cam to obtain pressure. The fact that this press has only three moving parts makes it extremely easy to maintain.

Any Numbering Machine, automatic or non-automatic, Typeholders with interchangeable Steel Type, or Special Dies can be operated in this Press.

Write for bulletin TP-136

NUMBERALL STAMP & TOOL CO.
HUGUENOT PARK STATEN ISLAND 12, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1883

MICROSTRUCTURES OF DIAMOND SURFACES

by S. TOLANSKY, Ph.D., D.Sc., F.R.S.

The remarkable pictures obtained by Professor Tolansky in his research laboratory and reproduced in this book (many of them never before published) enable fundamental new deductions to be made regarding the nature of diamond surfaces and therefore of the growth of diamond.

The text is written for the general reader and includes an elementary introduction to the optical techniques developed by Professor Tolansky that make such photographs possible. These techniques enable height or depth features as small as one twenty-five millionth of an inch to be resolved and effective magnifications in depth of half a million times to be made by simple and inexpensive means. One hundred and forty-three of these extraordinary pictures are reproduced as special plates in this book. $8.50* per copy.

CONTENTS:

- The Optical Techniques
- Some Characteristics of Diamond
- The Topography of the Natural Octahedron Faces
- The Nature of the Trigons
- Some Growth Features on Octahedron Faces
- Linear Discontinuities on Diamonds (Slip?)
- The Etching of Diamond
- Diamond Cleavage
- Optical Shadow Casting
- Percussion (Pressure) Marks on Diamond
- Polished Diamond
- 143 Special Art Plates

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Electro Metallurgical Company, a division of **Union Carbide and Carbon Corporation,** has completed a new chemical engineering building in Niagara Falls, N. Y. This building is one of ten which make up the company's Metals Research Laboratories for the development of new metals and metal compounds.

◆

A new $280,000,000 expansion program at **Kaiser Aluminum & Chemical Corporation** will bring the company's total primary aluminum capacity up to 654,000 tons. The expansion will increase the firm's basic capacity by more than 50% and make the company the nation's second largest aluminum producer. Major projects under the program will be the building of plants at Ravenswood, W. Va., and Gramercy, La.

◆

A modernization and expansion program designed to increase valve production by 50% has been undertaken at the Barberton, O., Division of **Rockwell Manufacturing Company.** The plan involves additional manufacturing and shipping space, foundry renovation, and machine shop expansion.

◆

H. W. Loud Machine Works, Inc., Pomona, Calif., is completing a $700,000 plant and facilities expansion program. The company produces aircraft major assemblies and sub-assemblies.

◆

A $5,500,000 aluminum extrusion plant is being built by **Reynolds Metals Company** near Richmond, Va. The new unit is expected to be in production by late 1956, supplying the eastern market with aluminum extrusions.

◆

American Can Company is planning the erection of a new plant in Salem, Ore. The structure will occupy about 135,000 sq. ft. of floor area.

◆

AC Spark Plug Division of **General Motors Company** will build a new plant near Milwaukee, Wis. The new building covering about 75,000 sq. ft., is the first of several buildings to be constructed on the site to house the division's expanding electronics and defense manufacturing work.

Aluminum Company of America will install a new rolling mill to fabricate aluminum alloy sheet in light gauges and narrow widths. The 44" mill will be added to the sheet rolling equipment at the company's Alcoa, Tenn., works. An extension will be added to the Alcoa North plant to house the new mill.

◆

A 12,000-sq.-ft. factory building under construction at Van Nuys, Calif., will double the production capacity of **Lovequist Engineering Company.** The firm manufactures aircraft parts and machine tools.

The S-P Manufacturing Corporation of Cleveland, O., has begun construction of a new plant in Solon, O. The company makes power chucks and cylinders.

◆

Axelson Manufacturing Company, Division of **U. S. Industries, Inc.,** has announced an expansion of its aircraft manufacturing factory at Montebello, Calif. The new 120,000-sq.-ft. building adjoining the present plant will cost over $1,000,000. It will provide increased production facilities for aircraft landing gear and components.

SHELDON
CHICAGO U.S.A.

NEW Sebastian 13"
A-5 GEARED HEAD
PRECISION LATHE

Speed changes easily made by revolving speed dial on headstock

Heavy, multiple Splined Spindle with "Zero Precision" tapered roller bearings

Quick change Gear box provides 60 different threads or feeds — has built-in lead screw reverse

Massive 1-piece, double walled apron with gears running in oil has "1-shot" pressure lubrication system for carriage and ways

Cam action tailstock clamp permits rapid release and instant locking of tailstock

Available in 5 ft., 6 ft. and 8 ft. bed lengths. Also, SHELDON - Sebastian 15", No. B-5 Geared Head precision lathe.

This is a completely new Sebastian Lathe *designed and built by Sheldon* . . . a rugged work horse with extra power, toolroom accuracy and all the modern features that make for money-saving production . . . with all controls centrally grouped in easy reach for safe efficient operation.

Modern, heavy cast-iron pedestal (included in base price of lathe) completely encloses motor and drive . . . with storage space in tailstock leg for tools and chucks.

Run this new Sebastian lathe. Test its performance. You will appreciate the powerful cuts that this lathe can take. Write for circulars on 13" and 15" Sebastian lathes and name of nearest dealer where you can see and operate these outstanding lathes.

SHELDON MACHINE CO., INC.
4235 N. Knox Ave., Chicago 41, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1891

MEN YOU SHOULD KNOW

The appointment of **Robert W. Farren** to the newly created position of executive assistant to the president has been announced by The de Silvey Corp.

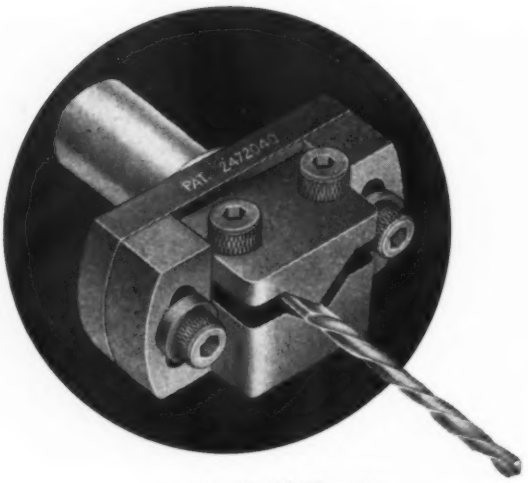
◆

Dr. Lauchlin M. Currie has become vice president of Union Carbide Nuclear Co., a division of Union Carbide and Carbon Corp. He joined Union Carbide as a research chemist for National Carbon Co. in 1925.

Louis M. Campani has been appointed chief administrative engineer for The Liquidometer Corp. **Julius V. DiFranco** has been promoted to chief electrical engineer and **P. Richard Rosenberg** to chief mechanical engineer.

◆

Ralph W. Rawson has joined Fansteel Metallurgical Corp. as chief engineer in charge of the company's newly established centralized engineering dept.



in half the time

Brookfield Tool Holders

make tool set-ups easy!

Now, without bushings or collets, on the first try you can set up drills, counterbores, reamers or cutters for almost any machining operation. Precision ground V-jaw vises, Brookfield Tool Holders make even toughest set-ups a cinch. With one wrench, insert the tool, tighten the jaw, then float the tool into dead center position and tighten. It's as easy as that!

FREE! *Descriptive illustrated brochure, plus price and specification lists.*

BROOKFIELD, INCORPORATED

STOUGHTON 115, MASSACHUSETTS

CIRCLE INFORM-A-GRAM KEY NO. 1901

Clarence A. (Larry) Nadsady has been appointed general manager of the Cleveland plant of The Efficient Tool & Die Co. **Karl Eschelbach** has been named sales manager for the company.

◆

S. S. Price and **A. H. Adams** will step into two newly established engineering posts in the Distribution Assemblies Dept. of General Electric Co. Mr. Price will be manager - panelboard and motor control design engineering. Mr. Adams has been made manager - switch board and distribution center design engineering.

◆

Martin C. Falk has been appointed chief research engineer for The Yoder Co. The company manufactures electric weld tube and pipe mills, cold roll forming machinery, and slitting equipment.

◆

Three promotions have been made by Titan Metal Mfg. Co. **Grey W. Tressler** has been named vice president in charge of manufacturing; **Marvin J. Rothrock,** vice president and director of purchases; and **W. E. Dunnick,** works manager.

◆

F. A. W. Anger has been named director of manufacturing for Axelson Mfg. Co., Div'n of U. S. Industries, Inc. He'll be responsible for all manufacturing of petroleum equipment, machine tools, and aircraft products at the company's Montebello and Vernon plants.

◆

Square D Co. has named **Dr. John D. Leitch** as vice president-engineering and **Alvin C. Dyer** as vice president and general manager of Electric Controller and Mfg. Co., a division. Dr. Leitch will coordinate engineering activity for Square D plants in nine U. S. cities and in Toronto and Mexico. Mr. Dyer joined the company in 1913.

◆

A. J. DeWolf has been elected president and treasurer of Dreis & Krump Mfg. Co. He succeeds **Walter H. Dreis** who died recently.

◆

George Gorton Machine Co. has held an election of officers. **George Gorton III** is the new president; **Charles Gorton,** vice-president-manufacturing; **James Gorton,** vice president-research and development; and **Walter B. Tomlinson,** vice president and treasurer.

◆

The appointment of **Claude L. Boring** as general manager of Erie Foundry Co. has been announced by **James A. Currie,** president. Before joining the company he was division manager of Plomb Tool Co.

MEN YOU SHOULD KNOW

Michael L. Kendall has been appointed engineering and maintenance consultant for The Hartford Special Machinery Co. in the Detroit area. He has been trained in all phases of special machines from engineering to sales and service. The company has also named **Paul H. Richardson** as vice president in charge of engineering. Prior to joining the firm, he was general manager of Paragon Gear Works, Inc.

◆

William M. Briner is the new production control manager in the fastener div'n at Standard Pressed Steel Co., succeeding **William M. Kerrigan.** Mr. Briner's duties in industrial relations will be handled by **Fred C. Gartling.**

◆

Gilbert R. Semans has become assistant director of metallurgy and research at Jessop Steel Co. He was formerly a research associate at Universal-Cyclops Steel Corp.

◆

Richard H. Latimer has been named plant superintendent by The Colson Corp., according to an announcement by **Robert A. Pritzker,** president. He replaces **Arthur Davis** who retired recently. Mr. Latimer had been plant superintendent for Eagle Mfg. Corp.

◆

J. Joseph Kelly has been promoted to vice president in charge of sales for Reed-Prentice Corp. **Frederick W. McIntyre, Jr.** will take over as vice president and works manager for the company.

◆

Pratt & Whitney Co., Inc. has named **Irwin F. Holland** a special assistant to the manager of the cutting tool and gage divisions. He has been with the company since 1915. **Edward J. Shages** will become factory manager of the divisions.

◆

The newly created position of chief engineer for Crucible Steel Co. of America will be filled by **Bernard L. Jones.** At the same time the company announced that **Tore Wallin** will be assistant chief engineer.

◆

Two new managers for American Can Co. have been announced. **Tracey A. Burnham** will manage the plant at Boston and **J. Fred Smith** the one at Philadelphia.

◆

Clarence Wantz will take over as chief engineer in charge of the engineering dept. of Robertshaw Thermostat Div'n of Robertshaw-Fulton Controls Co. Mr. Wantz who replaces **M. C. Potter,** has had nearly 30 years' experience in the development of control devices for the gas industry.

The Eagle Lock & Screw Co. has promoted **John Regan** to vice president in charge of sales and **Vincent H. Szamier** to vice president in charge of manufacturing.

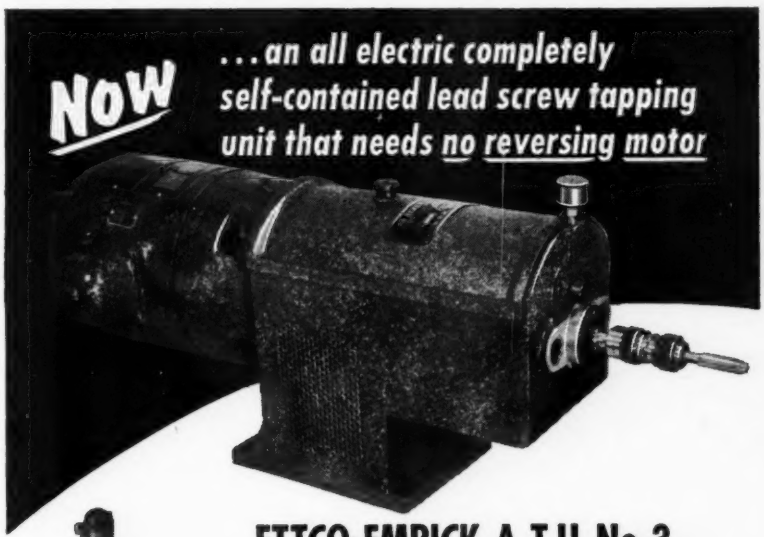
◆

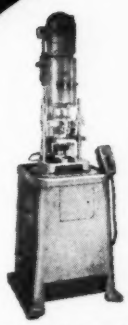
G. William Knepshield has joined the industrial goods dept. of McKinney Mfg. Co. He'll be in charge of acquainting industrial firms with the company's facilities for producing metal stampings of ferrous and nonferrous metals.

Merrill A. Hayden will take over as general manager of Waterbury Tool, Div'n of Vickers Inc. Mr. Hayden who joined the parent firm in 1935, is replacing **Warren E. Rouse** who is retiring.

◆

Howard J. Findley has been elected president of The Cleveland Hobbing Machine Co. He will also serve as vice president and as director of engineering and research for The Fanner Mfg. Co.





The ultimate in tapping speed and economy. A.T.U. No. 3 Lead Screw Tapping Machine with Ettco-Emrick multiple spindle head and work holding fixture.

A. T. U. No. 3 Lead Screw Tapping Unit with Ettco-Emrick multiple tapping head.

ETTCO-EMRICK A.T.U. No.3

with forward and reverse electric clutches

Fastest, most accurate and simplest method of lead screw tapping yet devised! Utilizes instantaneous-acting forward and reverse electromagnetic clutches to make tapping easy and automatic. Check these features:

1. All-electric operation and control.
2. No reversing motor required — electromagnetic clutches control tap direction.
3. Built-in rheostat control permits torque of clutches to be adjusted over a range of from 0 to equivalent of 2 hp.
4. Thread depth control to within ¼ turn of tap.
5. Readily interchangeable lead screws and nuts.
6. Operates in any position—horizontal, vertical or at any angle.

The A.T.U. No. 3 Lead Screw Tapping Unit can be incorporated into a limitless variety of tapping setups using Ettco-Emrick fixed or adjustable spindle multiple heads, work holding fixtures, etc.

Bulletin No. A.T.U. has details. Send for a copy.

ETTCO TOOL CO., INC.

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Distributors throughout the U.S. and Canada

TAPPING ATTACHMENTS • MULTIPLE HEADS • TAPPING MACHINES • INDEXING FIXTURES • TAP AND DRILL CHUCKS

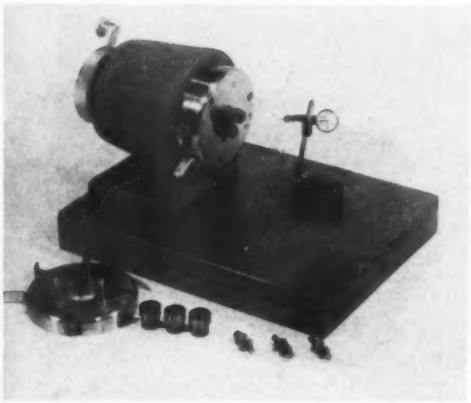
CIRCLE INFORM-A-GRAM KEY NO. 1911

PROGRESS

NEW DEVELOPMENTS • IMPROVEMENTS • COST AND TIME SAVERS

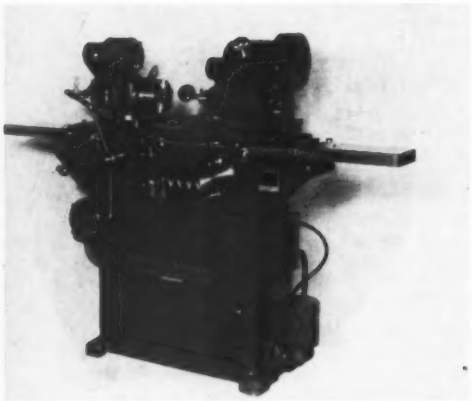
SELF-CENTERING AIR VISE . . .

Automatically center parts varying in size and shape with a self-centering air vise produced by Heinrich Tools, Inc., Racine, Wis. Model 22 holding power on the work is approximately 3000 lbs at 100 psi.
Inform-A-Gram No. A1.



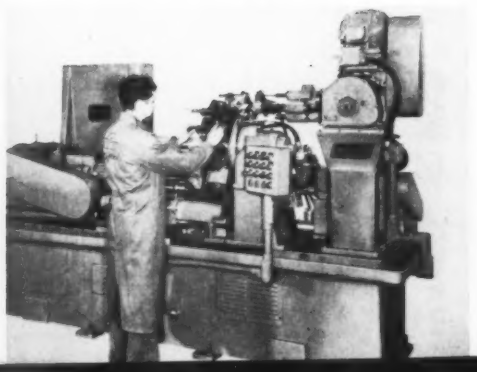
CHECKS SHOULDER SQUARENESS . . .

A new gaging fixture verifies the shoulder squareness of threaded precision parts. The squareness thread checking fixture is used in the aviation industry and where extreme accuracy is required in threaded parts. It has an inspection range from ¼" to 1½" thread dia. Pratt & Whitney Co., Inc., W. Hartford 1, Conn., or —
Inform-A-Gram No. A2.



PRECISION SIZING . . .

A semi-automatic grinder will handle toolroom, semi-production, and production I.D. grinding. Two models are available, one has a 12" table travel and the other 24" travel. A specially designed wheel dresser aids the machine in producing the proper hole size. Parker-Majestic, Inc., 147 Jos. Campau Ave., Detroit 7, or —
Inform-A-Gram No. A3.

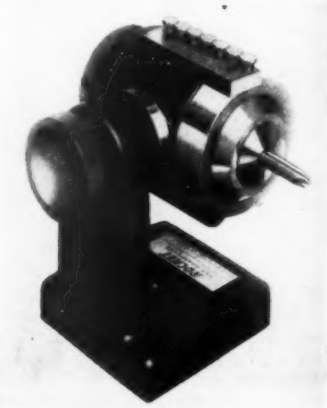


MILLING AND THREADING MACHINE

This indexing type machine completes 430 parts/hr. It employs 2 lead screw tapping units and a cam feed drill unit in a 4-station operation. This machine will hollow mill and thread stems, and drill and tap for zerk fittings. The Hartford Special Machinery Co., 287 Homestead Ave., Hartford, Conn., or —
Inform-A-Gram No. A4.

TAP SHARPENER . . .

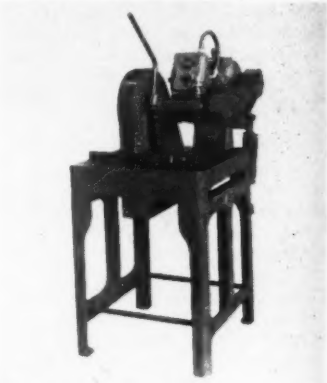
An improved "Rocket" tap sharpener is being manufactured by the Rockford Die & Tool Works, Inc., Rockford, Ill. It will resharpen left or right hand taps of 2, 3, or 4 flutes. The sharpener can be used on any



make or size grinder with a magnetic chuck. Holes can be drilled in the base to permit its use on a standard grinder. Equipped with a ½" collet, it will accommodate any standard 5-C collet of ⅛" to 1" capacity.
Circle Inform-A-Gram No. A5.

CUTOFF MACHINE . . .

The "Comet" model "Tabor-Brasive" cutoff machine will handle steel barstock in 1" dia rounds or equivalent area, or 2" dia ⅛"wall tubing. A totally enclosed motor maintains specified cutting speed and is adjustably mounted for proper drive



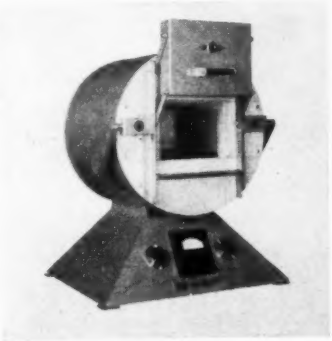
belt tension. End play is eliminated because the machine features Tabor shim-adjusted bearing-mounted spindle and trunnion. Tabor Mfg. Co. Div'n, Turbo Machine Co., Lansdale, Pa., or — **Inform-A-Gram A6.**

ON PARADE

Mail FREE Inform-A-Gram Card for MORE Details.

MUFFLE FURNACE . . .

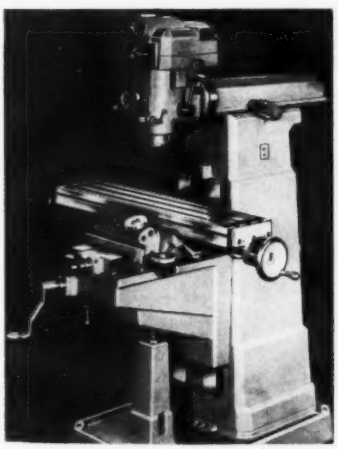
A new large size automatically controlled muffle furnace for continuous operation to 1850°F has been produced. This round model allows for additional insulation and rapid heating, and



reduces radiation losses. All the necessary temperature indicating and control devices are located in the pyramid type furnace base. Hevi Duty Electric Co., Milwaukee 1, Wis., or — **Circle Inform-A-Gram No. A7.**

MILLING MACHINE . . .

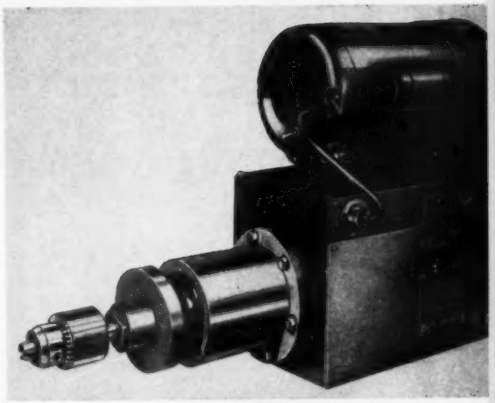
Feeds from 80 to 570 rpm in the low speed range and 584 to 3800 rpm in the high range are provided by the infinite speed drive incorporated in a new vertical milling machine. No belt changes are necessary. The Logan Mill features a built-in



tachometer which makes the exact spindle speed visible to the operator. Because of the positive control of the quill feed, correct depth may be obtained when blind drilling. Logan Engineering Co., 4901 W. Lawrence Ave., Chicago 30, or — **Circle No. A8.**

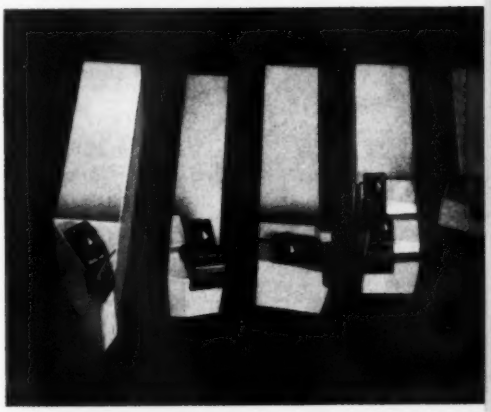
AUTOMATIC DRILLING UNIT . . .

Drilling, reaming, deburring, and related operations are handled by the Dumore automatic drill unit, Series 26. This economical unit is ideal for long production runs and stationary set-ups. Speeds, feeds, and depth can be pre-selected and need no attention during operation. Dumore Precision Tools, 1300—17th St., Racine, Wis., or — **Inform-A-Gram No. A9.**



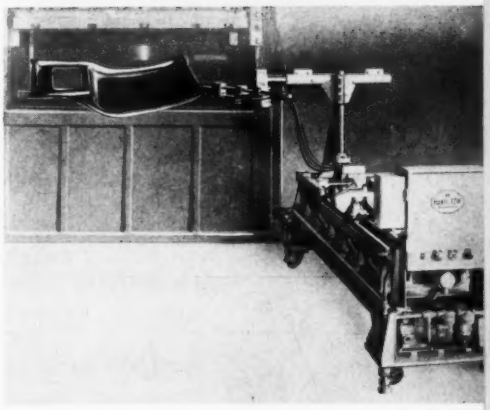
CARBIDE INSERTS AND THROWAWAY HOLDERS . . .

A complete range of styles and sizes of carbide inserts and throwaway holders are being offered by Valenite Metals Corp., Box 205, Royal Oak, Mich. The tips come in 4 grades and 2 ranges — general purpose and heavy duty, with 3 thicknesses for each range. **Inform-A-Gram No. A10.**



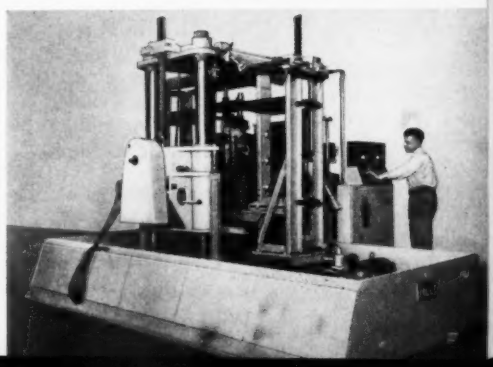
AIR PUMP PRESS HAND . . .

Parts are pulled from the die press automatically at the rate of up to 30 strokes/min. The press hand is suited for job shops and metal stamping departments. It isn't necessary to cut special clearances to facilitate handling. It is made in 3 sizes — 24, 36, and 48" strokes. Hamilton Automation, Inc., Hamilton, O., or — **Circle No. A11.**



TUBE SHEET DRILLING MACHINE . . .

Drill precision holes in condenser tube sheets at feeds up to 18 in/min with an automatic tube sheet drilling machine. Thinner sheets and baffles can be drilled in stacks up to 10" thick. Load meters are set to retract the drill under overload conditions. Walter P. Hill, Inc., 22183 Telegraph Rd., Detroit 19,or — **Circle No. A12.**



Tough grinding jobs?

Check *Vulcanaire* high speed precision grinding heads!

Grinding circular slot using Vulcan's Rotary Table and Magnetic chuck.

Many seemingly impossible grinding problems have been solved by adapting Vulcanaire to standard machines or by using one of Vulcan's specially designed machines.

On Surface Grinders, merely remove wheel and guard, clamp vertical or horizontal adaptor to machine as illustrated. No belts necessary. For instance, Vulcanaire used in connection with Vulcan's Rotary Table for Surface Grinders permits the grinding of a circular slot.

Adaptors are in stock to fit the spindle of Vertical Milling Machines for grinding contours, holes and slots.

On Internal Grinding Machines Vulcanaire's infinitely controlled speeds furnish the correct surface cutting speed resulting in faster production and micro finish. The adaptor sleeve fits into present housing.

Applied to Jig Boring Machines, Vulcanaire is liked by leading precision manufacturers because its accuracy is guaranteed, producing Vulcanaire jig grinding of large and small parts.

Vertical adaptor for Surface Grinders. Grinding small slots

Send us a blue print on your toughest grinding problem. Recommendations and sketches will be returned to you — no obligation.

Horizontal application. Grinding a shoulder Punch.

Major Vulcan Services

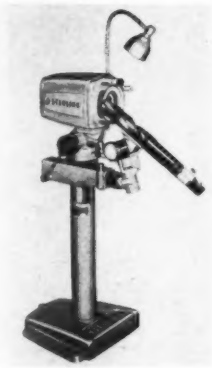
Engineering, Processing, Designing and Building... Special Tools... Dies ... Special Machines ... Vulcamatic Transfer Machines ... Automation ... including the Vulcan Hydraulics that Form, Pierce, Assemble and size. ... Vulcanaire Jig Grinders ... Motorized Rotary Tables ... Plastic Tooling.

VULCAN TOOL CO.

741 LORAIN AVE., DAYTON 10, OHIO

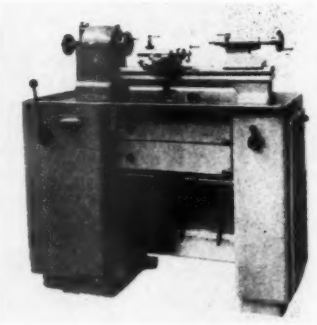
CIRCLE INFORM-A-GRAM KEY NO. 1941

Completely Eliminate Regrinding with a new "Lifetime" face mill body which accommodates industry standard holders and "throw away" carbide inserts. Built-in adjustments permit using standard tool bits with disposable carbide blanks having 6 engineered cutting edges which can be changed in seconds. Nelco Tool Co., Inc., Manchester, Conn., or — **Circle No. A13.**

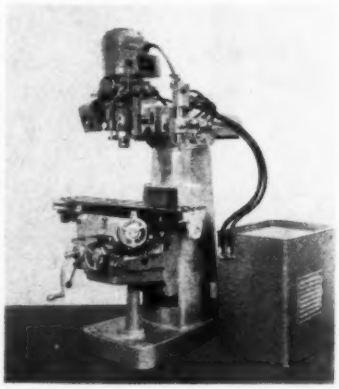


90° to 140° Included Angles can be ground on a new Sterling drill grinder, Model "DV". The included angle may be changed accurately by tilting the work-holding unit. A built-in clearance gage indicates the clearance angle being ground on any size drill. It has the same capacity as Models "DA" and "DB" — 2, 3, and 4 flute drills from ⅛" to 2½" dia. McDonough Mfg. Co., Eau Claire, Wis., or — **Inform-A-Gram A14.**

A Lathe Cabinet Stand SV 102-80 increases the range and usefulness of Schaublin lathes. The pedestal is a one-piece casting which withstands vibration and insures positive stability. It is made to accommodate a series of standard units. Carl Hirschmann Co., Inc., Manhasset, N. Y., or—**Circle No. A15.**

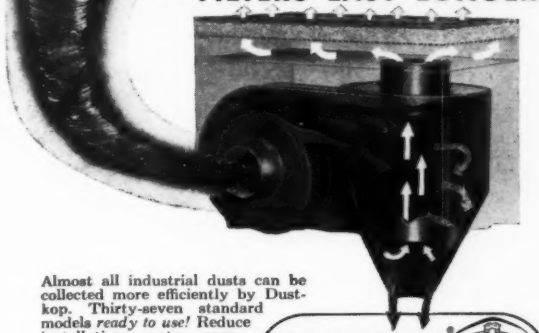


For Accurate Economical Production of a wide variety of small sized dies and molds, use the "Contourmaster" tool and die milling machine. It features automatic hydraulic depth tracer, anti-friction hand feed screws, and micrometer depth gage. Eight spindle speeds are provided ranging from 215 to 5650 rpm. Shown is Style 1-B "Contourmaster" produced by The Cincinnati Milling Machine Co., Cincinnati 9. **Circle No. A16.**



CYCLONE SEPARATION

FOR MORE EFFICIENT DUST COLLECTION —FILTERS LAST LONGER



Almost all industrial dusts can be collected more efficiently by Dustkop. Thirty-seven standard models *ready to use!* Reduce installation costs — save space. Write for descriptive literature.

ALSO A COMPLETE LINE OF MIST COLLECTORS

DUSTKOP STOPS DUST

AGET MANUFACTURING COMPANY
1394 EAST CHURCH ST., ADRIAN, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 1951

PROTECT METAL TOOLS & PARTS IN SHIPPING, HANDLING OR STORAGE

Thermo-Cote

STRIPPABLE PROTECTIVE COATINGS provide

•HERMETIC SEAL• CUSHION PROTECTION

Crystal clear for instant identification or inspection. Low cost — reusable.
Gov't approval to Spec. JAN C-149.
Write for special introductory offer or send samples for free evaluation.

BISCHOFF CHEMICAL CORPORATION
115 MAIN STREET, IVORYTON, CONN.

CIRCLE INFORM-A-GRAM KEY NO. 1952

YESTERDAY'S PIONEER · · · TODAY'S LEADER

TAPERED END MILLS

CONSTANT SPIRAL
(Die Sinking Cutters)

• The extensive line of the well known Weldon End Mills includes Tapered End Mills, Constant Spiral. Also known as Die Sinking Cutters, these end mills, filling a definite need, come in a wide range of sizes, giving a choice of many lengths and diameters. Weldon Tapered End Mills as standard stock items are all 3-flute, and offer a choice of ½°, 1°, 1½°, 2°, 3°, 5°, and 7° angles, taper on side. They represent the same high quality for which all Weldon End Mills are famous.

Weldon distributors throughout U.S.A. and Canada carry complete stocks to serve you.

THE WELDON TOOL COMPANY
3000 WOODHILL ROAD · · · CLEVELAND 4, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1953

SPEED UP PRODUCTION

with these PALMGREN

ANGLE VISES · MACHINE VISES

ROTARY TABLES

See how Palmgren vises, rotary tables, milling attachments and other machine tool accessories can speed up YOUR production and save time and money, too. Used in all industries, EVERYWHERE. 64 different models and types. Send for new catalog No. 203.

$39.95

No. 24B ANGLE VISE

4" jaw

Solve difficult Angle jobs on the production line—quick, accurate setups at any angle in such operations as drilling, milling, grinding. Also other jaw sizes: 1½", 2½", 3", 4", 6" and 8".

No. 60B MACHINE VISE

6" jaw

$89.95

A precision vise, with or without swivel base, constructed for heavy-duty service in such jobs as milling, drilling, grinding, shaping and other operations requiring a rugged holding device. Also 40B—4" jaw.

$69.95

No. 83 ROTARY TABLE

Two cross feed slides and Rotary Feed converts your drill press for vertical milling. The No. 83 has an 8" diameter top with T slots ⅝" x 1" x 5/16" for keys or T bolts. Rotary dial is graduated in 3 minute intervals.

CHICAGO TOOL AND ENGINEERING CO.

8388 South Chicago Ave. • Chicago 17, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1961

Horberg PIN GAGES *drill sizes taper entry*

Unlimited time and cost saving advantage in set-up, production, final inspection, wherever holes or slots must be accurately gaged, determined and located.

- Accurate to —.0001" —.0000"
- Concentric taper on lower half .001" smaller than gage size.
- Oil hardened tool steel — standard 1½" length.

PAIRED SETS IN CONVENIENT, INDEXED PLASTIC CASE

Letter sets — 52 gages, A-Z in pairs
Fraction sets — 60 gages, 3/64" to ½" in steps of 1/64" in pairs.
Number sets — 120 gages, 1 to 60 in pairs
Individual gages in stock — extra stands available
All items stocked for immediate delivery

THE *Horberg* GAGE COMPANY

29 STAPLES ST., BRIDGEPORT, CONN.

QUANTITY		
____Letter Sets	@ $ 60.00	
____Fraction Sets	@ $ 66.00	
____Number Sets	@ $120.00	
____Single gages	@ $ 1.50	
____Case alone	@ $ 15.00	

Please rush checked items and literature to:

COMPANY _____

ADDRESS _____

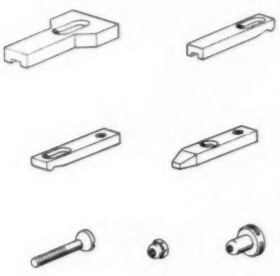
NAME _____

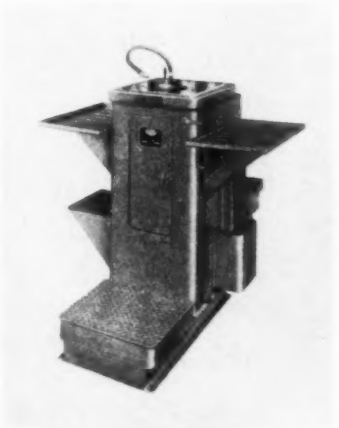
TITLE _____

CIRCLE INFORM-A-GRAM KEY NO. 1962

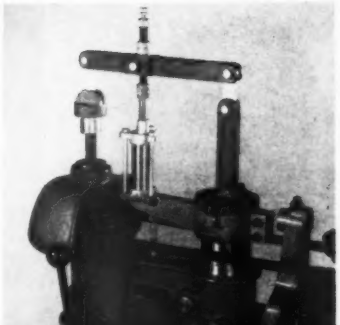
A 5/16" Miniature Mandrel provides an accurate means of holding and locating a precision aircraft part for semi-automatic finish grinding to a shoulder. It features a 1/32" expansion and a stop for positive location. Le Count Tool Works, Inc., 390 Capitol Ave., Hartford, Conn., or — **Circle Inform-A-Gram A17.**

A New Line of stainless steel clamps for precision tooling are now available. Shown are the sliding — wide face and round nose, and rear tightening — round nose and taper nose types, produced in a wide range of sizes. Also pictured are the swivel stud, hex swivel nut, and knurled swivel nut. Von Industries Inc., 192 Hillside Ave., Williston Park, N. Y., or — **Circle A18.**





Perform Internal or Surface Broaching with a new heavy duty, vertical pull down broaching machine. Model VT830 is a low cost machine which incorporates a 22"-square unobstructed work table. The hydraulic machine is available in 6 or 8 ton models. Pioneer Broach Co., 6434 E. Telegraph Rd., Los Angeles 22. **Circle No. A19.**



A "Handraulic" Drilling Attachment limits and controls the pressure and speed of downward movement of the spindle of drill presses so that small holes can be drilled in most types of machineable materials. Work-hardening of materials at the drill point is prevented and drill breakage minimized. For further details on the Williams Company "Handraulic" drilling attachment, contact Deejl Pacific Co., 1149 N. Las Palmas Ave., Los Angeles 38, or — **Circle Inform-A-Gram No. A20.**

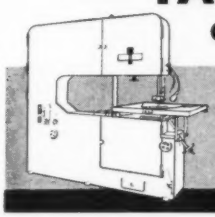
FRICTION SAWING with Tannewitz HIGH SPEED BAND SAWS

FASTEST, BEST MEANS OF CUTTING METALS

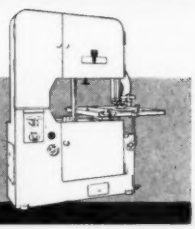
If you are not familiar with the advantages of friction sawing with these machines, by all means drop us a line asking for "Friction Sawing Data." You can save many times the cost of a Tannewitz High Speed Band Saw and greatly expedite production by using it to cut sheets of both hard and soft steel, formed or flat, trimming malleable and steel castings, cutting armor plate or many other materials. Write NOW!

THE TANNEWITZ WORKS

GRAND RAPIDS, MICHIGAN ☎ GL-6-1729



TANNEWITZ DI-SAWS — 24", 36", 48", 60" CAPACITIES
for CONTOUR SAWING, FILING, POLISHING
The smoothest, fastest, most trouble-free Di-Saws on the market. Write for bulletin.

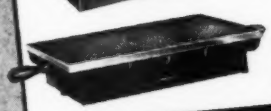


CIRCLE INFORM-A-GRAM KEY NO. 1971

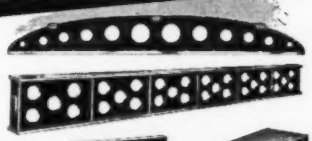
CHOOSE CHALLENGE . . .
and be precision sure!

CHALLENGE SURFACE PLATES

New! Clovis Black Granite Rated Class A. Surface accuracy guaranteed. 24 sizes.



Special Analysis Semi-Steel Fine grain. Precision ground or hand scraped.



STRAIGHT EDGES for lathe bed ways. PARALLEL STRAIGHT EDGES for inspection of alignment.

UNIVERSAL BOX ANGLES Parallel to within .00025-inch.

V-BLOCKS V accuracy of .0005-inch.

ANGLE PLATES In 22 sizes for clamping & holding work.

BOX PARALLELS In every size for every use.

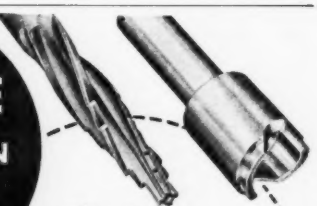
782

Challenge

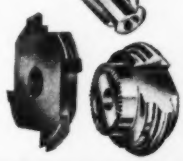
THE CHALLENGE MACHINERY COMPANY
Office, Factories and Show Room:
GRAND HAVEN, MICHIGAN
DEALERS IN ALL PRINCIPAL CITIES

CIRCLE INFORM-A-GRAM KEY NO. 1972

REDUCE PRODUCTION COSTS



Eliminate Extra Operations —Use Spiral's "Multiple-Operation" Step Tools



Carbide and High Speed

Step drills, step reamers, milling cutters, seating and grooving tools, trepanning tools, form tools, carbide and high speed, made to your specs or designed by our engineers to fit your needs. Form ground with "radial relief" gives up to 500% more tool life, imparts smoother finishes on piece parts. Send for details.

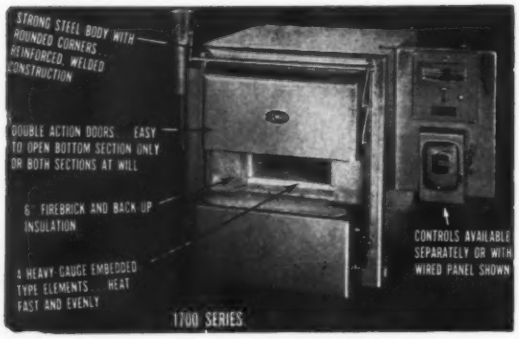
SPIRAL STEP TOOL COMPANY

Designers and Manufacturers of All Types of Special Cutting Tools
5400 N. Damen Avenue • Chicago 25, Illinois
Phone: LOngbeach 1-5384

CIRCLE INFORM-A-GRAM KEY NO. 1973

CUT HEAT-TREAT COSTS

. . . with this versatile Temco bench furnace for heat-treating dies, parts, tools, etc.


STRONG STEEL BODY WITH ROUNDED CORNERS REINFORCED, WELDED CONSTRUCTION
DOUBLE ACTION DOORS... EASY TO OPEN BOTTOM SECTION ONLY OR BOTH SECTIONS AT WILL
6" FIREBRICK AND BACK-UP INSULATION
6 HEAVY-GAUGE EMBEDDED TYPE ELEMENTS... HEAT FAST AND EVENLY
CONTROLS AVAILABLE SEPARATELY OR WITH WIRED PANEL SHOWN
1700 SERIES

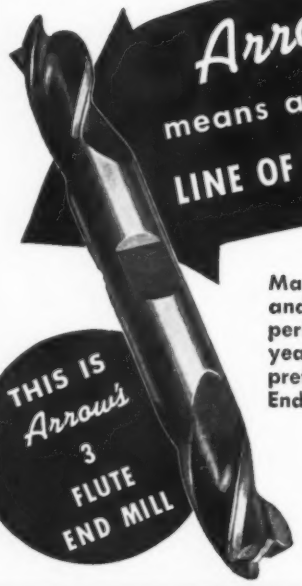
Speed production, lower unit costs with this husky electric furnace. Large enough to take a wide variety of work, yet compact and exceptionally convenient to use. Chamber sizes—9½" wide, 8½" high and 13½" or 18" deep. Heating range 350° to 1900° F., 220 V. operation. Price with controls, $332.50 to $569.00. Furnace only $235 to $297. Write for literature and nearest dealer's name.

TEMCO® **ELECTRIC FURNACES**

Thermo Electric Mfg. Co., 474 Huff St., Dubuque, Iowa

CIRCLE INFORM-A-GRAM KEY NO. 1981

ARROW TOOL & REAMER CO. • Established 1916



Arrow means a complete LINE OF END MILLS

THIS IS *Arrow's* 3 FLUTE END MILL

Manufacturing skill and tool making experience for over 37 years — adds up to preference for Arrow End Mills.

Call your Distributor or write direct for literature

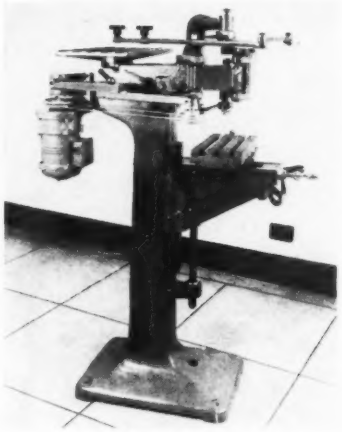
ARROW TOOL & REAMER CO.

418-422 Livernois Ave. • Detroit 9, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 1982

A Self-Adjusting Live Center has been designed for lathes and grinding machines. Its design permits heavier loads with an accuracy of 0.0001" or less, because of the heavy and comparatively short spindle which minimizes deflection. J & S Tool Co., Inc., 87 Dorsa Ave., Livingston, N. J., or — **Circle No. A21.**

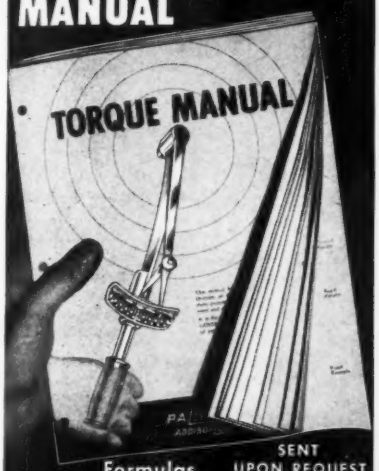
Fast Direct Setting plus extreme accuracy are features of the new direct setting Electrolimit external gage. It is ideal for gaging parts of similar but different sizes, for gaging several dimensions on a single part, and for use as a comparator on short runs. It can be set direct to 0.0001" without using masters. Pratt & Whitney Co., Inc., W. Hartford 1, Conn., or — **Circle No. A22.**



A 2-Dimensional Engraving Machine has been introduced by J. Arthur Deakin & Son, 150-28 Hillside Ave., Jamaica 32, N. Y. Alexander 1-A standard machine is ideal for producing and duplicating extremely fine, precise engravings. On this model, the working area has been increased 150%. Eight spindle speeds up to 15,000 rpm are provided. **Circle No. A23.**

Diamond Drag Marking of precision parts of hardened steel, titanium, etc. is performed by a diamond marking unit. It is used to mark precision aircraft parts. The new marking method eliminates the disadvantages of damaged work, abrasions of surface, discoloration, etc. H. P. Preis Engraving Machine Co., 647 — U. S. Route 22, Hillside, N. J., or — **Circle Inform-A-Gram No. A24.**

"TORQUE WRENCH" MANUAL



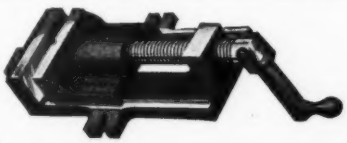
SENT UPON REQUEST

Formulas
Applications
Engineering Data
Screw Torque Data
Adapter Problems
General Principles

PA STURTEVANT CO.
ADDISON QUALITY ILLINOIS

Manufacturers of over 85% of the torque wrenches used in industry

CIRCLE INFORM-A-GRAM KEY NO. 1991



YOST DRILL PRESS VISE

• This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

OFFERED IN TWO SIZES

Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
1D	3½	4	12½
2D	5	5½	23

Do you need a vise of ANY type?
Write today for bulletin on the extensive Yost line

YOST MFG. COMPANY
124 Grant St.
Cambridge Springs, Pa.

CIRCLE INFORM-A-GRAM KEY NO. 1992

CAMS ALL TYPES MADE TO YOUR SPECS

Charles Eisler Jr.
President

EISLER ENGINEERING CO., INC.
732 SO. 13TH ST., NEWARK 3, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 1993

ALINA KNURL CUTTERS

ALINA KNURL CUTTERS actually mill the pattern and produce chips in the process. Alina Knurl Cutters will cut your machining time approx. 30%. They will provide the solution to some of your most complex knurling problems.

DESIGNED TO

- knurl all machineable materials
- knurl thin-walled parts without internal support
- maintain fine diametral limits
- knurl diameters from 1/16" to 10 ft.

Models available for all types of machines.
For detailed information and prices, write to

ALINA CORPORATION • 401 Broadway, New York 13, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1994

STYLE AND SIZES FOR ALL MACHINES ON WHICH THREADS ARE CUT

This die head is unique

THERE IS NO OTHER LIKE IT

It cuts threads with insert chasers. These are, in reality, small sections of the business end of large and expensive chasers, but with this important difference: *their cost is so low they can be even thrown away when dull.* For example, for less than $40 you can get a dozen sets of insert chasers, each set ground ready to go. Change now to insert chaser die heads and watch your performance improve. "Unified and American Screw Thread Digest" sent free on request.

THE EASTERN MACHINE SCREW CORPORATION 29-49 Barclay St., New Haven, Conn.

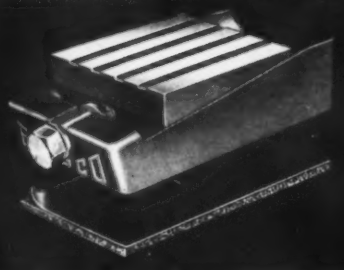
CIRCLE INFORM-A-GRAM KEY NO. 1995

MR. PRODUCTION FOREMAN:

YOU, TOO, WILL BE ASKED THIS QUESTION SOONER OR LATER, BETTER CHECK UP BEFORE IT'S TOO LATE!
WE'LL SEND YOU COMPLETE INFORMATION AND PRICES VIA RETURN AIR MAIL!
Phone, wire or write us RIGHT NOW!

Severance TOOL INDUSTRIES INC.
730 Iowa Avenue, Saginaw, Michigan
Representatives and Distributors in Principal Industrial Areas.
CIRCLE INFORM-A-GRAM KEY NO. 2001

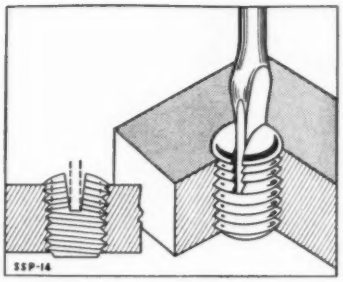
MAXIMUM Performance
MINIMUM Maintenance



with EMPCO Machine Leveling Jacks!

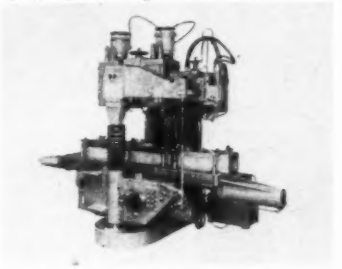
Now—get peak efficiency from every machine you operate! Use Empco Jacks with Vi-Sorb mounting pads to absorb machine vibration . . . reduce maintenance expense! Easy to install and relocate, Empco jacks permit quick, level machine set-ups. It's simple to re-level too—a turn of the Hex screw does the job. Available in six styles and 25 models, Empco jacks are designed to meet any machine leveling requirement. Write TODAY for complete information and illustrated bulletin.

THE ENTERPRISE MACHINE PARTS CORP. EMPCO PRODUCTS
2735 JEROME AVENUE • DETROIT 12, MICHIGAN
CIRCLE INFORM-A-GRAM KEY NO. 2002

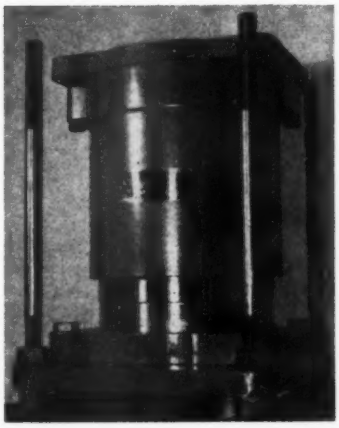


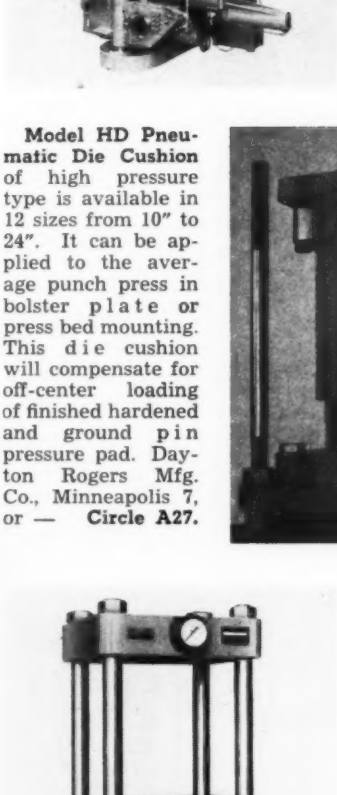
The New "Spred-Lok" Set Screw is suited for soft metal applications. The top of this headless, self-locking set screw is spread during manufacture, to provide the locking action. Set Screw & Mfg. Co., 158 Main St., Bartlett, Ill., or — **A25.**

A Line of Automatic Hydrocopy Die Sinking Machines has been introduced by Cosa Corp., 405 Lexington Ave., New York. Six different models provide a choice of 1, 2, 4, or 6-spindle machines. Illustrated is the KA 200/-2. These "Rigid" die sinkers will copy workpieces from masters to an accuracy of ± 0.002". They feature an automatically constant surface travel of the cutter regardless of the contour being milled. **Circle A26.**



Model HD Pneumatic Die Cushion of high pressure type is available in 12 sizes from 10" to 24". It can be applied to the average punch press in bolster plate or press bed mounting. This die cushion will compensate for off-center loading of finished hardened and ground pin pressure pad. Dayton Rogers Mfg. Co., Minneapolis 7, or — **Circle A27.**





Air - Powered Elmes Hydrolair Presses are now available in 75 and 100 ton sizes, in addition to the 30 and 50 ton sizes. These low cost production presses have neither motors nor pumps. The "Power-Petuator", a hydraulic intensifier, is powered by compressed air. They can be used for laminating, assembly, forming, etc. American Steel Foundries, Elmes Engineering Div'n, 1150-Y Tennessee Ave., Cincinnati 29, or — **Circle A28.**

SPECIFY KASSON PRECISION COLLETS AND ATTACHMENTS

IMMEDIATE DELIVERY FROM STOCK

3AT, 3C 1A, 4C 5C

480 (AC-50)

All collets in hexagon, square and round.

KLUTCH-KOLLET

Step collet for accurate chucking to 2¾" dia. Soft head for easy boring. Lowest price on market! Models 3AT, 3C, 5C.

FOR ATLAS • LOGAN • SOUTH BEND CRAFTSMAN • SHELDON LATHES, ETC.

LEVER-TYPE DRAWBAR ½" cap.

Positive grip on undersize, oversize or standard diameter work! Patented coordinate cams eliminate fingers.

Let us quote on your quantity orders for any type of collet, live center or other machine tool attachment!

HAND DRAWBAR ½" cap.

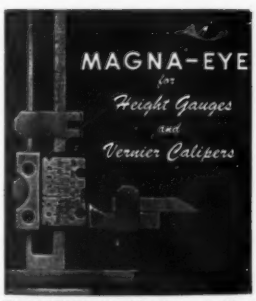
LIVE CENTER (Ball Bearing) Double sealed for accuracy.

KASSON Precision

KASSON Precision products are guaranteed unconditionally for accuracy, fit and long life. Your dealer should have them . . . Write us for literature!

KASSON DIE AND MOTOR CORP. 32-14 Northern Boulevard LONG ISLAND CITY 1, N. Y. | Integrity Since 1919

CIRCLE INFORM-A-GRAM KEY NO. 2011



MAGNIFIES "HARD-TO-READ" VERNIER SCALES ON HEIGHT GAGES AND CALIPERS

MAGNIFIES the "hard to read" vernier scales on calipers and height gages. No more eye strain, guess work or hit or miss setting and reading. LENS is finest quality optical glass, specially designed and ground for the purpose with utmost optical skill. 4X magnification shows lines true and correct. In daily use in plants of Westinghouse, General Electric, General Motors, Chrysler, Packard, Ford, Boeing Aircraft, Bendix Aviation and many others engaged in defense work.
Made in 3 sizes to fit Starrett, Brown & Sharpe, Lufkin Tools, and others of similar design. 8 No. 100 for 6" Vernier Calipers; 8 No. 200 for 10"-12" Height Gages, also 10"-18"-24" Vernier Calipers; 8 No. 300 for most popular type 18" and 24" Height Gages and for 36"-48" 60" and 72" Calipers.

For Complete Information Write, Phone or Wire

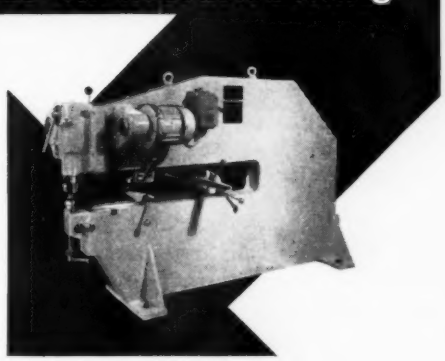
STEBAR COMPANY
217 28th Ave. North Minneapolis 11, Minn.

CIRCLE INFORM-A-GRAM KEY NO. 2012

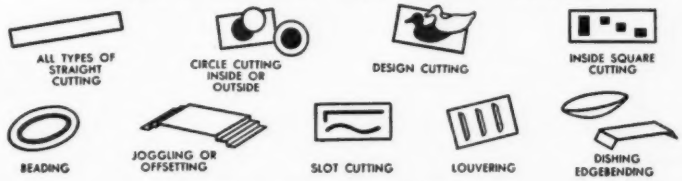
YOU'LL BE AMAZED at what PULLMAX DOES in metalworking

1 machine can do all these jobs in your shop

Ask any Pullmax user and he'll usually say, "I don't know how we ever got along without it." 7 sizes of Pullmax cut mild steel up to 1½". Pullmax does all the jobs shown here and generally pays for itself in three or four months by saving time, labor and material.



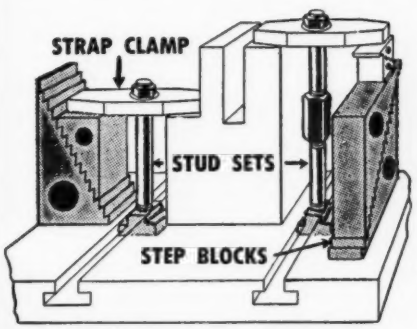
PULLMAX DOES ALL THIS WORK



COMPLETE NATIONAL SALES AND SERVICE
WRITE FOR THE PULLMAX CATALOG OF MONEY-SAVING METALWORKING IDEAS

AMERICAN PULLMAX COMPANY, INC.
2469 North Sheffield Avenue • Chicago 14, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 2013



SURE-GRIP STEP BLOCKS

Clamping tools of all types.

Write for free tracing templates

TIETZMANN TOOL CORP.
Box 277
North Main St., Englewood, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 2014

LUCAS TOTE PANS

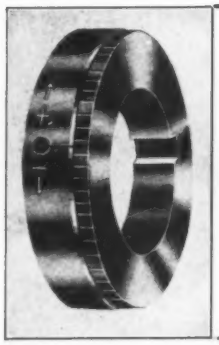
HELP SOLVE PRODUCTION PROBLEMS!

Lucas Tote Pans are built for long wear and ease of handling. Designed for every shop use—storing materials, holding parts for convenient handling by machine operators and at assembly lines, Lucas Tote Pans are available in nesting type, stacking type, straight side and assembly or bench pans. Lengths from 10" to 32", widths from 5" to 23" in standard sizes. Other sizes made to your specifications.

For Further Information, Write

J. L. LUCAS & SON, INC. Bridgeport 5P, Conn. Tel. CLearwater 9-3393

CIRCLE INFORM-A-GRAM KEY NO. 2015



MILLING MACHINE SPACING COLLARS

SAVE TIME

ON GANG MILLING SET - UPS

These MICROMETER ADJUSTABLE SPACING COLLARS are designed for accurate spacing of side milling cutters, gang milling and various other multiple setups on milling machines. Accurate spacing of the milling cutters is easily made by merely loosening the cutter arbor nut and making a plus or minus adjustment.

You will be assured of a QUICK, ACCURATE and POSITIVE ADJUSTMENT at all times.

For immediate delivery specify size and mail orders to . . . . . .

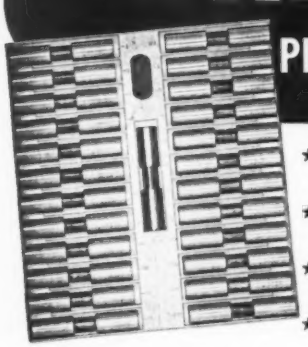
Size of Cutter Arbor	Maximum Outside Diameter	Price
⅞	1-9/16	$11.50
1	1-13/16	11.50
1¼	2-1/16	12.25
1½	2-7/16	12.25
1¾	2-3/4	14.50
2	3-1/16	16.50

DAYTON ROGERS
Manufacturing Company

MINNEAPOLIS 7 B, MINN.

CIRCLE INFORM-A-GRAM KEY NO. 2021

CLOSER TOLERANCES with DELTRONIC TENTH PLUG GAUGES



★ Size variation by ten thousandths

★ Set of 25 costs approximately same as Go and No-Go gauge.

★ Available in increments of 1/64" from 1/8" to 1"

★ Hardness is Rockwell C62/C64

This new system of precision gauging provides one gauge of nominal size plus 12 gauges of increasingly larger sizes in .0001" increments and 12 gauges of decreasingly smaller sizes in increments of .0001". Each gauge is identified. It is the same size on both ends to double the life in usage.

For further information write Dept. D1.

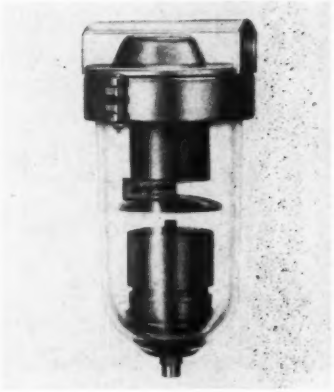
DELTRONIC CORPORATION
1507 RIVERSIDE DRIVE • LOS ANGELES 31, CALIF.

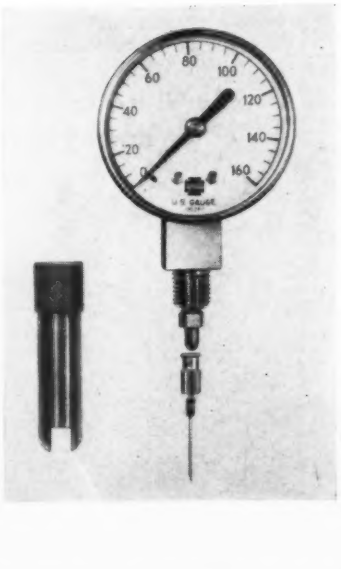
CIRCLE INFORM-A-GRAM KEY NO. 2022

A Stereoscopic Microscope for tool makers and industrial use is used for fine measurement of opaque objects. Model 0.245S has a single axis micrometer stage and crossed-hair reticle for measurement in thousandths of an inch. Two matched sets of eyepieces are provided to give magnification of 12½X and 37½X. Pacific Transducer Corp., 11836 W. Pico Blvd., Los Angeles 64, or — **Circle No. A29.**

A High Torque Vertical Sander has been designed for use with soft resilient backup pads and abrasive disc, Precision gearing gives 5-lb Model 201 speeds of 1800 and 3200 rpm. It will perform high surface finishing. Master Pneumatic Tool Co., Inc., Bedford, O., or — **Circle No. A30.**

Norgren Air Line Filters with automatic-draining facilities are available in ¾" and 1" pipe sizes. Models 11,200-6 and 11-200-8 create a strong centrifugal force that removes a high percentage of moisture from the air stream. C. A. Norgren Co., Englewood, Colo., or — **Circle A31.**





A Pressure Gauge for determining available air pressure at point of use has been produced by U. S. Gauge Div'n, American Machine and Metals, Inc., Sellersville, Pa. It permits tapping the air hose at the tool. The 2" dia gauge is finished in chrome and is equipped with a BD-20 hypodermic needle and guard.
Circle No. A32.

SHEARCUTTER PREMIUM
THREAD BROACHES
CUT TAPPING COSTS

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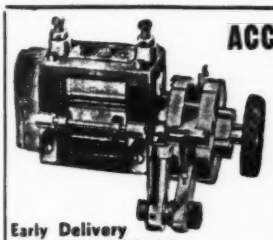
IT'S NEW
Shearcutter Premium
THREAD-CUTTING BROACHES
deliver these advantages:
- End tapping trouble.
- Produce threaded holes by a Shearcutting action.
- Are practically unbreakable.
- Ground from hardened high-speed solid blanks.
- Require only half the power needed for tapping.
- Have an amazing long life.
- May be resharpened many times.
- Feed the chips out of the hole.
- Lower production costs.
- Replace standard taps in most sizes.

SHEARCUTTER TOOLS COST LESS IN THE LONG RUN
These ultra-scientific cutting tools are used by practically every large manufacturing company in the U.S.A. Constant repeat orders prove their merit and value.
Patent Warning: All Shearcutter Tools are protected by U.S. and Foreign Patents, received, pending or applied for.

*ANOTHER AMAZING INVENTION OF RALPH GORDON FEAR

SHEARCUT TOOL CO.
MANUFACTURERS OF THE WORLD'S MOST SCIENTIFIC CUTTING TOOLS
7941 DARBY AVENUE Dept. G RESEDA, CALIF

CIRCLE INFORM-A-GRAM KEY NO. 2031



ACCURACY with SIMPLICITY
and LOW COST
with
"RFC" ROLL FEEDS

Models to fit:
ANY PRESS
FOR ANY JOB
FOR STOCK UP TO
12" WIDE

Early Delivery
on Standard Models

"RFC" ROLL FEEDS are quality built for long, dependable service.

Write for descriptive literature

ROLL-FEEDS CORPORATION
Pawtucket, Rhode Island
An Electrix Affiliate

CIRCLE INFORM-A-GRAM KEY NO. 2032

HAND KNOBS

6 SIZES
CAST IRON

Tapped, Reamed or Blank.
Hex-shaped hub for extra tightening.

Write for catalog

TIETZMANN TOOL CORPORATION
Dept. HK-2 • Englewood, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 2033

HIGHER SPEEDS/
FASTER GRINDING/

kipp

AIR GRINDERS

Model JA
50,000 R.P.M.
$42.00
IN U.S.A.

Weight 12 ounces; length 6¾ inches; chuck size ⅛ inch. Wheel guard removed for better illustration.

The RPM's stay up while grinding . . . not only when the grinder runs idle. That means better work—longer wheel life.

High speed grinding with small wheels was a Madison-Kipp development of the late twenties. It was born out of a pressing need in our tool room. Because tool room grinding problems are universal, we believe it will pay you to utilize Kipp grinders in your tool room as generally as we do in our own.

kipp

MADISON-KIPP CORP.
212 Waubesa St. • Madison 10, Wis., U.S.A.

CIRCLE INFORM-A-GRAM KEY NO. 2034

Let this automatic
STOCK FEED STOP
cut your labor bill!

DAHLSTROM AUTOSTOP
for punch press dies

$1.75 each

★ *SPEEDS PRODUCTION*
★ *CUTS WASTE*
★ *INCREASES PROFITS*

Every stroke is a production stroke when your press is equipped with the amazingly simple *Dahlstrom Autostop!* It's been tested and proven in years of actual use. Adjustable to work with *blanking, progressive or compound dies.* Mounts on stripper plate in 15 minutes—handles sheet steel up to ½" x 6" or equivalent weight. Lots of 12 or more, $1.50 each. Indicate compound or progressive dies.

Write for complete line bulletin describing Autostop, Tap Guides and Tap Chucks.

BRANCH MANUFACTURING CO. 16 Olson Drive North Branch, Minn.

CIRCLE INFORM-A-GRAM KEY NO. 2041

BALLS

- **All Materials**
  including carbides; hard cast alloys; stainless, chrome, and high speed steels; ceramics; plastics; synthetic sapphire.
- **All Sizes - Standard and Special**
  from 1/32" to 6" or larger.
- **All Quantities, Small or Large**
  from 10 balls to millions.
- **High Precision —**
  to .000010" on size and sphericity.
- **Engineering Service**
  at your disposal, upon request.

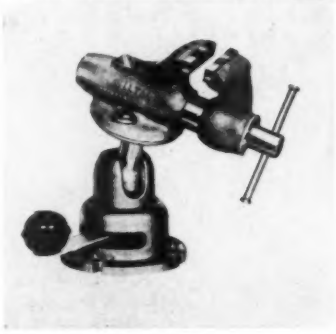
WRITE FOR quotation and descriptive bulletin.

INDUSTRIAL TECTONICS, Inc. ANN ARBOR 7, MICH.

ITI PRECISION BALLS
All Materials — All Sizes
In Large or Small Quantities

CIRCLE INFORM-A-GRAM KEY NO. 2042

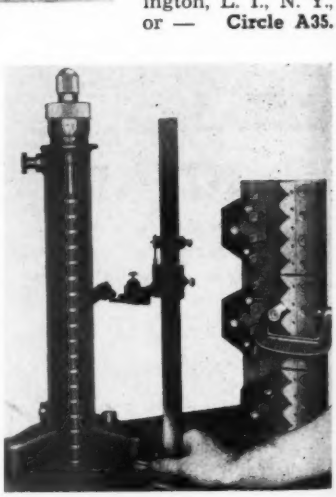
The "PowRarm" Work Positioner pictured is a redesigned model. The 2" jeweler's vise now mounted on it can be replaced with other holding fixtures so that the positioner can hold many varied types of work. Design changes include a new operating handle and cadmium-plated steel parts. Wilton Tool Mfg. Co. Inc., 9525 Irving Park Rd., Box 56, Schiller Park, Ill., or — **Circle A33.**



Convert Any Drill Press into a high production automatic for drilling, tapping, reaming, threading, counterboring, spinning, etc. with a new drill feed. The work cycle of the air-operated drill feed is started by foot pedal. Drill depth is controlled to an accuracy of ±0.002". General-Pacific Corp., 8740 Washington Blvd., Culver City, Calif., or — **Inform-A-Gram A34.**

A Complete Set of Ritmar tap extensions for remote-spot tapping are now available. The set includes 9 different sizes of extensions. These extensions will hold all standard sizes of taps from #0 thru ½". They can be used on production tapping machines as well as for hand tapping operations. Ritmar Corp., 183 New York Ave., Huntington, L. I., N. Y., or — **Circle A35.**

The 18" "Pla-Chek" Gage is designed for fast, accurate checking of medium size workpieces. It may be accurately set 5 to 20 times faster than other methods of comparable accuracy. Accuracy to 0.00005" throughout the entire 18" range is guaranteed. Cadillac Gage Co., 20316 Hoover Rd., Detroit 5, or — **Circle No. A36.**



GET ABSOLUTE *TOLERANCE HOLE DEPTH CONTROL*

with **WOHLNIP** NON-ROTATING DRILL STOPS

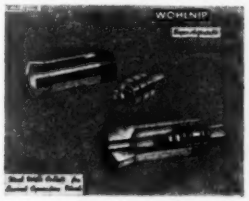
Will not mar, mark or damage the face of the work, fixture or bushing, yet give POSITIVE CONTROL OF HOLE DEPTH. Completely automatic, the WOHLNIP Drill Stop reduces human errors, simplifies difficult jobs, lowers machining cost, increases production, and eliminates rejects. Used for drilling, center drilling, countersinking, boring, milling, routing, reaming. Available with straight or taper shank, for any size drill or tool. (Patent Pending)

EXCLUSIVE DISTRIBUTORS WANTED

WOHLNIP Products, Inc.

634 Central Avenue • East Orange, New Jersey

CIRCLE INFORM-A-GRAM KEY NO. 2051



COLLET STOPS
(Patent Pending)

Used with collets for second operation work. Assuring consistent accuracy, permanent set-up, producing identical results. No alterations to your collets are necessary. Fully adjustable. Available for any size collets. END GUESS WORK AND REJECTS—

You Need an Extra Hand Now to Speed Up Production!

HEIMANN TRANSFER SCREW SETS

IN 11 SIZES No. 6 to 1" N.C. In all S. A. E. sizes.

Here is the *faster*, more precise way of transferring open and blind screw holes—make savings in "wage-dollars-per hour" of your expensive hands on every job. A die-and-tool maker's tool with many other applications for die makers and machinists. A set of 6 Hardened Screws nested in combination holder and wrench —no other tools needed. Get more work *now*—save money too!

HEIMANN MFG., CO. • URBANA, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 2052

CONTRACT TOOLING AND PRODUCTION

Illinois

DRESEL-BETZ CO.
Belleville, Ill.
Designers and Manufacturers of Tools, Dies, Jigs, Fixtures, Metal Stampings.

Michigan

DAVIS TOOL and ENGINEERING CO.
19250 Plymouth Road, Detroit, Michigan, VErmont 5-6000. Tools and Dies, Special Machinery. Sheet Metal Stampings and Assemblies.

New York

AMERICAN MEASURING INSTRUMENTS CORP.
The AMIC Bldg., 21-25 44th Ave., Long Island City 1, N. Y. Jigs, fixtures, gages, dies, precision parts.

Ohio

CLEVELAND UNIVERSAL JIG COMPANY
13404 St. Clair Ave., Cleveland, Ohio.
MU 1-2600
DESIGNERS AND BUILDERS
Jigs and Fixtures Special Machines
Production Engineering
Complete Plant Routing and Tooling

GENERAL DIE & TOOL CO.
2067 W. 55th St., Cleveland, Ohio
WO 1-4736
Dies, Tools, Jigs, Fixtures, Light Stampings, Special Machinery Manufacturing.

THE INDUSTRIAL MACHINE CO.
1436 East 47th St., Cleveland, Ohio. Founded in 1908. Builders of Special Machinery. General Machine Work.

KIFFER TOOL & DIE CO.
5801 Tillman Avenue, Cleveland, Ohio, WOodbine 1-2440 & 1-2441. Manufacturers of Special Machinery, Tools, Dies, Jigs, Fixtures, Swiss Jig Boring.

NOBLE & STANTON, INC.
998 Broadway, Bedford, Ohio, Bedford 2-2800. Tooling, Short Run Production and Machined Parts for Automation.

A. P. SCHRANER & CO.
3338 Payne Ave., Cleveland, O., HEnderson 1-8644. External Cylindrical Lapping Machines, Special Machinery, Tools, Dies, Jigs, Fixtures.

CAMS— ALL TYPES
to your specifications
Write for bulletin—NO OBLIGATION
SHAKER TOOL and DIE CO.
9823 Bessemer Ave., Cleveland 4, Ohio

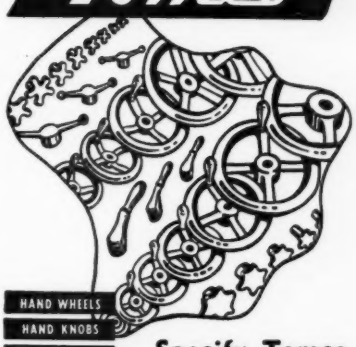
PRESSURELOK-224
the best diamond wheel ever developed for carbide tool grinding. Guaranteed ultimate cutting life from each diamond particle in every wheel.

UNITED STATES DIAMOND WHEEL CO.
1833 ILLINOIS AVE. AURORA, ILL.

IMMEDIATE DELIVERY on all wheel sizes, STRAIGHT, DISH, CUP, FLARE and MOUNTED WHEELS; HONES.

CIRCLE INFORM-A-GRAM KEY NO. 2053

Tomco



Specify Tomco for long lasting dependability

A complete line of high grade hand knobs, handles, and hand wheels is available from Tomco. Immediate shipments are made from stock of standard items. Specialty items are made to your specifications.

For original equipment or replacement parts look to Tomco for quality and service.

Write for literature

Tomco PRODUCTS CO.

1623 DOUGLAS AVE.
RACINE, WISCONSIN

Blank or Machined—from stock

CIRCLE INFORM-A-GRAM KEY NO. 2054

A SMALL LOT
METAL STAMPING SERVICE
AT LOWEST POSSIBLE DIE COST

FIRST... In Experience • In Know-how
• In Research • In Quality
• In Service

The sketch briefly describes the cost of a typical part made for one of our thousands of customers.

We have a short run stamping service to offer beyond comparison.

EXAMPLE

$63.20 for first 100 pieces including tools.

$5.20 for each additional 100 pieces plus material.

Factory trained representatives in all centers. Write for full details.

DAYTON ROGERS
Manufacturing Company
MINNEAPOLIS 7B, MINN.

CIRCLE INFORM-A-GRAM KEY NO. 2061

CARBIDE TOOLS
Precisionized by
GRAWELL

Grawell craftsmanship is inherent in Grawell Solid Carbide Tools . . . years of experience is reflected in the precision and long service life of these fine drills, end mills, reamers, grinding tools, centerlaps and burrs.

WRITE FOR NEW CATALOG TODAY DEPT. TPS

GRAWELL CARBIDE TOOL COMPANY
5680 12th ST., DETROIT 8, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 2062

METAL PRODUCTION CAPACITY AVAILABLE

For long or short production runs of large or small parts, tools, jigs or fixtures. Also dies, gages, special machinery.

KELLER PROFILOMETER-DUPLICATOR, 16" x 24"
PRESSES UP TO 450-TON, 48" x 48", TRIPLE ACTION
PLANERS UP TO 20-FOOT STROKE, 72" x 72"
RADIAL DRILL PRESSES UP TO 8-FOOT, 19" COLUMN
LATHES UP TO 158" c.c., 57½" gap, 40" SWING
BORING MILLS UP TO 120" BED, 90" HORIZ., 60" VERT.

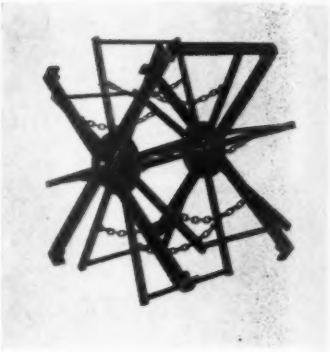
Also Milling Machines, Grinders, etc. Complete production facilities — experienced machinists.

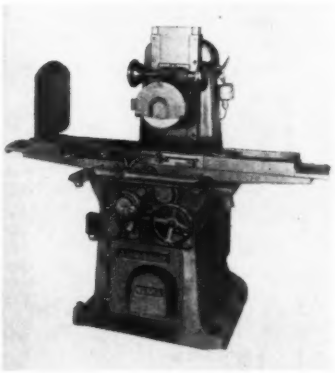
Inquiries Invited on Contract Basis or Individual Quotation

PIVOT PUNCH & DIE CORPORATION
NORTH TONAWANDA, N. Y. Phone JA. 1200

CIRCLE INFORM-A-GRAM KEY NO. 2063

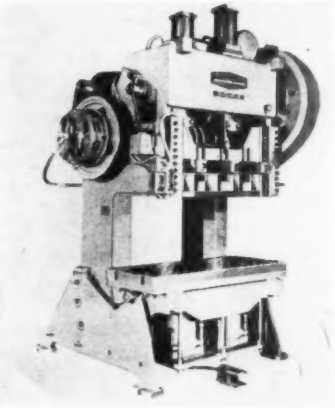
Rack Tumble in any standard barrel with the new "Lorco" universal tumbling fixture. It is built for assembly within the compartment. Parts are hung from chains or spring loaded rods. Lord Chemical Corp., Dept. J, 2068 S. Queen St., York, Pa., or — **Circle No. A37.**





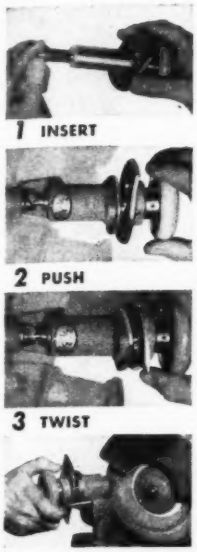
No. M3 Precision Surface Grinder has a built-in direct 2 - hp motorized spindle. It can grind with accuracy at table travel speeds of 20 to 60 fpm. Direct spindle drive differentiates it from No. 3B grinder. It has fully automatic feeds and built-in shock absorbers. Abrasive Machine Tool Co., East Providence, R. I., or — **Circle No. A38.**

Faster, Cleaner Power Cutting of ferrous and nonferrous materials at a rate of less than 4 sec/sq. in. is possible with Model M-35-A cut-off machine. It features an adjustable swivel head for angle cutting to 45° in either direction. Stone Machinery Co., Inc., Manlius, N. Y., or — **Circle No. A39.**

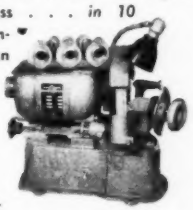


Double Crank Capacity Presses are offered in 60, 80, 100, and 125-ton capacities. G-2 Series has box-type rams, large bed areas, low inertia clutches, and electrical controls. Shown is the 60-ton model of this series. The speed of its backshaft is 303 rpm. Johnson Machine & Press Corp., Elkhart, Ind., or — **Circle A40.**

Now....Old Drills Good As New!



The BLACK DIAMOND Drill Grinder restores a worn drill to like-new precision sharpness . . . *in 10 seconds!* Any inexperienced man (or woman!) is an expert grinder with this unit. Both lips ground at once . . . web thinning equally simple! Pays for itself many times over!



Also manufacturers of the WORCESTER DRILL GRINDER for drills up to 2½".

FREE BULLETIN

Get all the facts! 4 page illustrated bulletin gives complete story. Write Today.

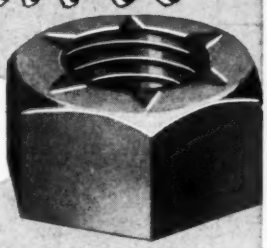
BLACK DIAMOND

SAW & MACHINE WORKS — 75 NORTH AVE. NATICK, MASS.

CIRCLE INFORM-A-GRAM KEY NO. 2071

use a **GRIPCO LOCK NUT**

- *To Hold Tighter*
- *To Last Longer*
- *To Cost Less*



in these and hundreds of other applications where stress, wear or vibration is a factor. The Gripco Lock Nut, with its simple, one-piece design, has given industry a tighter, more positive holding action for quicker fastener application at less initial cost. No inserts, outside devices or complicated features – the Gripco Lock Nut holding or locking action is inherent in the nut itself – it costs less to use, gives an easier, faster locking and holds tighter for a longer time. Impervious to oil or water. For faster production, lower manufacturing and maintenance costs, look into the Gripco Lock Nut today.

GRIPCO PRODUCTS INCLUDE: Gripco Lock Nuts, New Gripco "Clinch" Nuts, Gripco Hi-Nuts, Gripco Pilot-Projection and Countersunk Weld Nuts with or without Gripco locking feature.

112

GRIP NUT COMPANY

308W S. Michigan Avenue, Chicago 4, Illinois

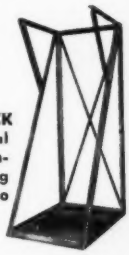
CIRCLE INFORM-A-GRAM KEY NO. 2072

NEW IDEAS

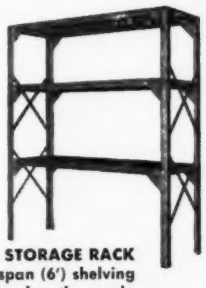
TO DOUBLE YOUR STORAGE CAPACITY

Time- and space-saving equipment of advance design . . . permits new economy, efficiency and handling ease . . . for every storage operation.

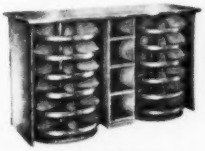
WAREHOUSE RACK
For storage of heaviest palletized loads — up to 4000 lbs. per shelf! No. WR-9



CONDUIT RACK
Permits vertical storage of conduit and tubing in lengths up to 10'.
No. ECR



BULK STORAGE RACK
Long-span (6') shelving handles lengthy packages or bulk loads.
No. BSR-247

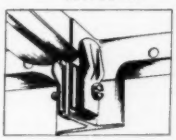


ROTABIN COUNTER
Permits finger-tip accessibility of many fast-moving small items. No. C-286-27-S

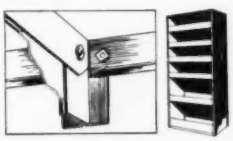
SERVICE CART
For moving small items quickly, safely in plant operation. No. SC-30

PALLET FRAME
Permits fast pallet stacking of irregular or crushable loads.
No. PF-44

ROTABINS
For broken package lots or large quantities of small items.



KLIP-BILT SHELVING
Installation is fast without tools . . . using simple clips.



ANGLE TYPE SHELVING
Offers a wide range of standard sizes, parts and accessories.

The FRICK-GALLAGHER MANUFACTURING CO.
WELLSTON, OHIO

Specialists in Storage Planning and Manufacturing of Storage Equipment

TELL ME MORE ABOUT STORAGE ECONOMY . . .
The FRICK-GALLAGHER MFG. CO.
106 So. Michigan Avenue, Wellston, Ohio

Please send me catalogs checked.

- ☐ Miscellaneous Equipment (Cat. No. 702)
- ☐ Klip-Bilt Shelving (Cat. No. 703)
- ☐ Rotabins (Cat. No. 110-A)
- ☐ Angle Type Shelving (Cat. No. 550)

Name_____
Company_____
Address_____
City_____ Zone____ State_____

CIRCLE INFORM-A-GRAM KEY NO. 2073

NOW... a new long-jawed
DE-STA-CO TOGGLE CLAMP
in steel or ALUMINUM!

Actually this photo shows two models—Model 491 (Steel) and Model 491-A (ALUMINUM)!—identical except for two things—491 is of hardened alloy steel and has a Trigger-Release Lever. BUT MODEL 491-A IS OF HEAT-TREATED ALUMINUM and has no Trigger-Release!

What's the difference? Steel is stronger. ALUMINUM IS LIGHTER! Model 491 (Steel) weighs 1 lb. 14 oz.; Model 491-A (ALUMINUM), only 10 oz.! 491 has holding pressure of 850 lbs.; 491-A, 300 lbs.! . . . Use steel for strength; ALUMINUM for lightness, to lessen worker fatigue, or for electronic welding, due to its non-magnetic qualities.

Write for Literature on Models 491, 491-A!

DE-STA-CO DETROIT STAMPING COMPANY
WORLD'S FIRST LINE OF TOGGLE CLAMPS
344 Midland Avenue • Detroit 3, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 2081

LITTELL REELS
FOR 300, 600 AND 1,000 LB. COILS DELIVERED FROM STOCK

No. 10 Littell Motor Driven Automatic Centering Reel for up to 1000 pound coils.

Three sizes of Littell Reels, for 300, 600 and 1000 pound coils are now in stock for *immediate* delivery. Easy to load, they center the coil automatically, hold it in balanced position. You get easy, smooth unwinding, greater accuracy and higher speeds for both hand and automatic feeding. All three sizes available in single or double Plain Brake or Motor Driven Reels. Write for catalog.

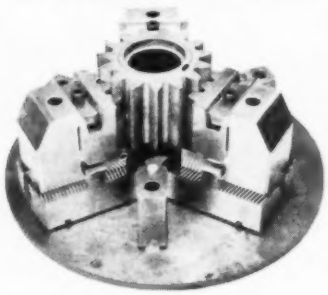
F. J. LITTELL MACHINE CO.
Speed with Safety

ROLL FEEDS • COIL CRADLES
STRAIGHTENING MACHINES
REELS • AIR BLAST VALVES
District Offices: Detroit, Cleveland

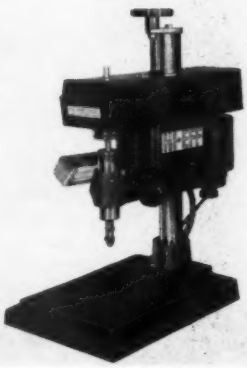
4197 N. Ravenswood Ave., Chicago 13, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 2082

A Universal "PD" Gear Chuck will reference spur and helical gears from their pitch line and will insure continued accuracy for machining or grinding operations on cut gears. It can be used with any standard, replaceable jaw type of chucks. Master Spline Tool & Gage Co., 19760 W. Eight Mile Rd., Detroit 19, or — **Circle A41.**

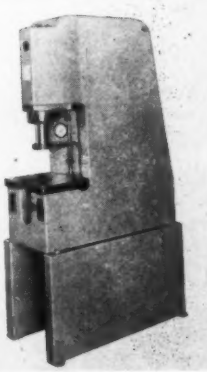


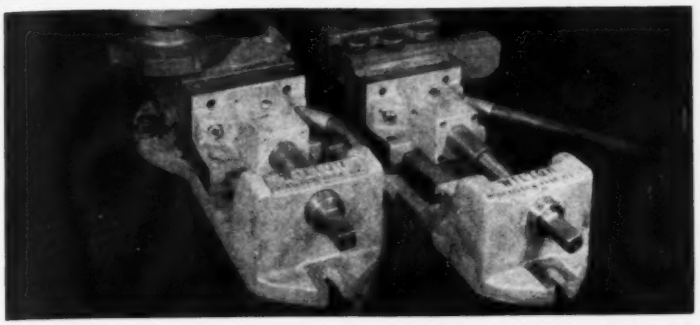
Series C, Model 64 Drilling Machine has been added to the line of "Hi-Eff" equipment produced by Taylor Dynamometer & Machine Co., 6411 River Pkwy, Wauwatosa 13, Wis. It is designed for high quality, sensitive precision drilling on a production basis.
Circle No. A42.



Two Small Air Cylinders have been added to the "Han-d-Air" line. One is a double-acting model and the other a single acting air-powered advance, spring return unit. They're used for all types of clamping, parts positioning, ejecting, and light-duty tool and work feeding operations. They're available in 1", 2", 3", and 4" strokes. The Bellows Co., Akron 9, O., or —
Circle No. A43.

New High Speed Hydraulic Presses for fast production will give up to 520 ipm closing and return speeds. They're compact, self-contained, and use a minimum of floor space. These presses are made in 10 and 20 ton capacities. The length of stroke can be set from ½" to 12". Northern Tool & Machine Co., 1545 N. 31st Ave., Melrose Park, Ill., or —
Circle No. A44.





BEAT THE TIME CLOCK WITH "MM"

Cut loading time 80%, turn out more work more economically with Wilton's fully automatic MilOmatic "MM" air-powered hydraulic vises. By using specially shaped jaw inserts you can make tooling changes quickly and practically eliminate costly fixture construction. Start using the "MM" NOW to increase milling, drilling, shaping, and broaching output—and cut tooling costs in YOUR plant!

Attach this ad to your letterhead and mail to us for a free 10-day trial or free literature!

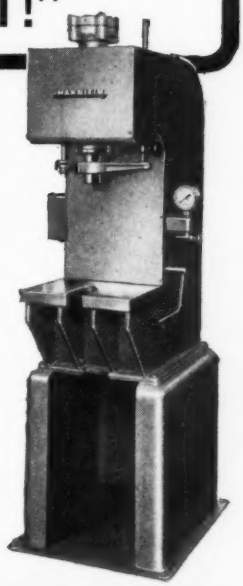
TP-2

WILTON TOOL MFG. CO., INC.
SCHILLER PARK, ILLINOIS

SOLD BY LEADING DISTRIBUTORS THE WORLD OVER

CIRCLE INFORM-A-GRAM KEY NO. 2091

"BEST $1286 WE EVER SPENT!"



That's the price of this 5-Ton HANNIFIN Press*

A lot of production men have made such comments about this versatile little hydraulic press.

They like the way you can adjust it to the exact force you need for each job, all the way from 1 ton to 5 tons. The backstroke is adjustable, too, so the ram just clears the work on any job. Fast-acting controls. Prompt delivery from stock.

WRITE. Complete information and prices on the Hannifin line of 1- to 10-ton Hydraulic Presses will be sent on request.

*Price complete with motor and starter F.O.B. our press plant, St. Marys, Ohio, subject to change without notice.

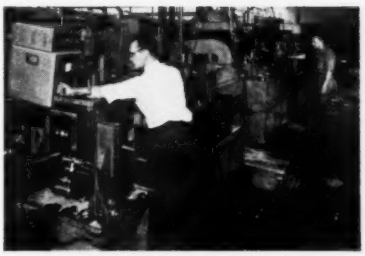
HANNIFIN

HANNIFIN CORPORATION, 563 S. WOLF ROAD, DES PLAINES, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 2092

Sperry
ultrasonic inspection news

Automatic Inspection and Control on Continuous Production Line



Continuous inspection of steel tubing and strip at production speeds is now an accomplished fact with the new Sperry Ultrasonic Reflectoscope and RA attachment. This unit scans material traveling at high speeds and registers the presence of both internal and surface defects. Far more thorough than the human eye, it provides for both defect recording and signaling in addition to continuous inspection. Designed to incorporate signal lights or alarm bells, as well as automatic marking and machine cut-off units, the Sperry Reflectoscope and RA attachment is a flexible, accurate instrument which opens a new area to more effective cost-cutting quality control.

sperry products INC.
Danbury, Connecticut

I would like to keep posted on latest developments in ultrasonic inspection by industry. Put me on the list to receive Sperry's new Ultrasonic Inspection Newsletter.

Name_____
Title_____
Company_____
Address_____
City_____ Zone_____ State_____

CIRCLE INFORM-A-GRAM KEY NO. 2093

Speed Versatility and Economy

Tooling costs go down when Speed Vise goes on the job because Speed Vise eliminates the need for expensive jigs and fixtures. Just a simple jaw plate to fit the part being drilled and Speed Vise does the rest. Several interchangeable Speed Vise jigs and fixtures can be made for the cost of one old style box type jig. The operation of Speed Vise tooling is **many times faster** than the operation of such conventional jigs and fixtures. Speed Vise tooling is economical to build, efficient to use, compact to store.

SPEED VISE GIVES YOU 100 JIGS IN ONE

$10.90 to $22.90

★ Quick action design for speed. Opens instantly to full capacity to handle work of any size.
★ Standardized holes for attaching jigs or jaw plates.
★ Lift...slide...lock...that's all there is to the fast, positive locking action.
★ Heavy, semi-steel castings for extra strength and a heavy base plate for rigidity.

Write or wire now for information

CARDINAL MACHINE COMPANY

1819 Dana Street, Glendale, California

CIRCLE INFORM-A-GRAM KEY NO. 2101

FEDERAL SHORT RUN STAMPINGS COST LESS

Federal's "secret" recipe for Cutting Costs
KNOW HOW
Engineering Skill
Creative Ingenuity
30 years of Short Run Stamping Experience
FULL OF SHORT RUN STAMPING TIPS!

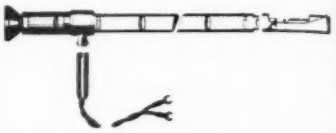
- Large, modern plant specializing in Short-Run Stampings.
- A vast "Library" of special Federal dies—to reduce your costs.
- Well Equipped . . . row after row of the latest, most modern, high speed precision machines.
- These are but a few of Federal's plus values—so valuable in cutting costs, and increasing speed and accuracy.

Send for Catalog 201 . . . Costs and materials are graphically illustrated. Tells where and how you can save money for your plant by using Federal Short Run Stampings.

Federal TOOL AND MANUFACTURING CO.
3614 ALABAMA AVE. • MINNEAPOLIS 16, MINN.
QUALITY STAMPINGS IN SMALL QUANTITIES

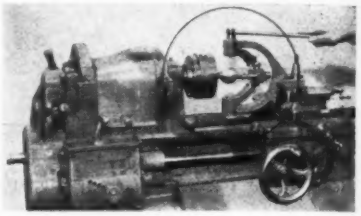
CIRCLE INFORM-A-GRAM KEY NO. 2102

Simplify All Types of "Blind" Inspection with the endoscope. This unit is a slender tube equipped with self-contained lighting and lenses. A bright, accurate image is trans-



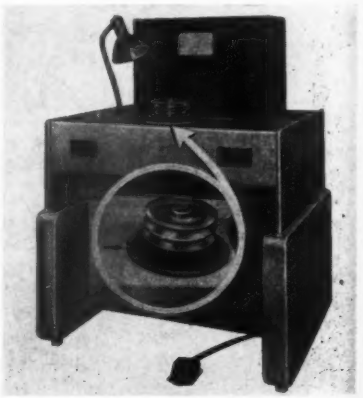
mitted from the point of examination to the eye-piece for direct viewing or to a camera for photographic recording. Homestrand, Inc., 9 Addison St., Larchmont, N. Y., or — **Circle Inform-A-Gram No. A45.**

Turn Convex and Concave Radii with the new "Raditurn". This universally adjustable tool holder will also cut any ball radius and locate for form grinding tools. It will cut



tool steel, aluminum, plastic, etc. "Raditurns" are available for all sizes of lathes. Plastic Mould and Moulding Co., Inc., 456 N. Holmes Ave., Indianapolis 22, Ind., or — **Circle Inform-A-Gram No. A46.**

Two Vertical Static Balancing Machines have been added to the line of Beko static and dynamic balancers produced by Balance Engineering Co., 850 W. Lake St., Chicago 7. Model 201-VL has weight capac-



ities of 1 to 20 lbs and Model 201-VH, 5 to 75 lbs. Both will handle 20" dia. They're used for balancing impellers, blower wheels, flywheels, fans, pulleys, and other parts having no integral shaft.
Circle Inform-A-Gram No. A47.

BORING TOOLS

HIGH SPEED or CARBIDE For MASS PRODUCTION

- ECONOMY IN PRODUCTION
- FAST PERFORMANCE
- HIGH PRECISION BORING

→ FOR HOLES FROM 1/16" UPWARD

→ 17 DIFFERENT SIZES

HIGH SPEED or CARBIDE For MASS PRODUCTION

→ FOR HOLES FROM 1/16" UPWARD

→ 17 DIFFERENT SIZES

FACING TOOLS

- CONSTANT CLEARANCE
- EASY RESHARPENING
- CONSTANT SHAPE OF CROSS-SECTION
- INDISPENSABLE FOR JIG-BORING

INTERNAL THREADING TOOLS

For PRECISION THREADING

→ FOR HOLES FROM 1/16" UPWARD

→ 17 DIFFERENT SIZES

- CONSTANT SHAPE & CLEARANCE
- EASY RESHARPENING
- CONVENIENT TO USE-LONG LIFE
- CUT PERFECT FITTING THREADS

Made of SUPER-HIGH-SPEED STEEL specially treated (Available in Carbide)

Write for Complete Data on all Tools

COMET Tool Co.

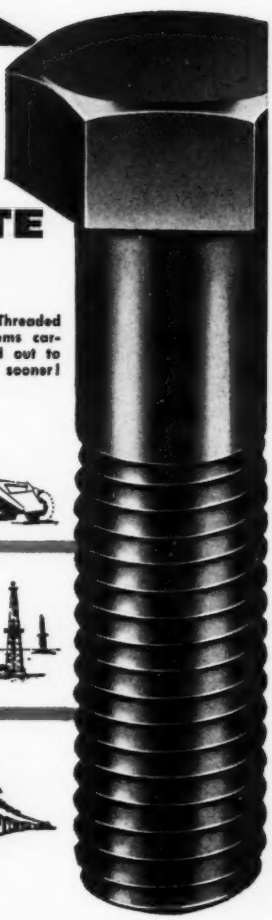
738-T BROADWAY • NEW YORK 3, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 2111

here's what We mean by a

COMPLETE LINE

Our new catalog of Standard Threaded Products lists over 4000 items carried in stock to be shipped out to you within 24 hours—often sooner!



FOR ANY PURPOSE

IN ANY SIZE

IN ANY QUANTITY

...from a package to a carload

Our maintaining such large stocks of all 4000 items means lower costs to you because no large inventories are needed, service is faster. Our better methods of manufacture produce a higher quality product. Good reasons why so many industrial users in the last 83 years have come to specify "Chicago" Screws.

Service-Conscious Industrial Supply Distributors EVERYWHERE carry complete stocks of "Chicago" Products. To speed delivery time, call the one nearest you.

40B

CHICAGO SCREWS

The CHICAGO SCREW COMPANY
ESTABLISHED 1872
2519 Washington Boulevard
Bellwood, Illinois

The complete Chicago "Safety Plus" line includes in alloy steel: Socket Set Screws • Socket Head Cap Screws • Socket Stripper Bolts • Square Head Dog Point Set Screws • Socket Pipe Plugs • Flat Head Socket Cap Screws • Dowel Pins • Hexagon Keys and Key Kits • Also Socket Set Screws and Socket Head Cap Screws in Stainless.

The complete "Chicago" line of Standard Products includes: Hexagon Head Cap Screws in steel—bright and Grade 5, heat treated, also in brass and stainless • Square Head and Headless Set Screws • Taper Pins • Steel Studs • Flat and Fillister Head Steel Cap Screws • Hexagon Nuts in steel, brass and stainless • Castle Nuts, steel.

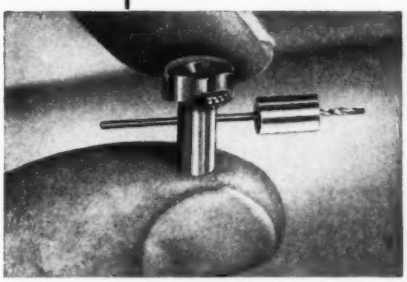
CIRCLE INFORM-A-GRAM KEY NO. 2113

***ULTRA PRECISION BUSHINGS . . .**

For gauge assemblies, flow orifices, wire drawing dies, etc. Guaranteed accuracy to .0001 in bores up to ⅜" long.

★

With Micro Drill Guides



Special Holes are Standard!

No change in price or delivery for metric and special hole sizes in STANDARD MICRO DRILL GUIDE RANGE OF #80 to 3/32" in listed body sizes.

LONGER LIFE

No counter bore . . . diamond lapped hole with full length drill bearing.

Also Available

- Special Micro Drill Guides with body sizes other than those listed and hole sizes not in the standard ±80 to 3/32" range.
- Job micro-drilling of your parts.
- Engineered MICRO-TOOLING, drills, jigs, collets, etc.

MICRO DRILL GUIDE

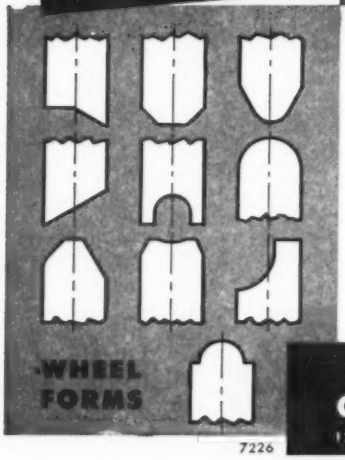
DIVISION JESSUP ENGINEERING AND DEVELOPMENT COMPANY
2980 SUPERIOR AVENUE CINCINNATI 14, OHIO

DISTRIBUTORS REPRESENTATIVES

We Now Have Some Areas Available. Contact Us Immediately.

CIRCLE INFORM-A-GRAM KEY NO. 2112

Precision Dress Grinding Wheels to ANY FORM IN ¼ THE USUAL TIME



The Perfex TANGI-MATIC Dresser is a self-contained precision tool built by an organization of master gagemakers for high precision work.

Any shop man who can read a "mike" can operate the dresser the first time. No Jo Blocks, no height gages or other auxiliary tools needed. All radii and angles are read directly.

Write for Descriptive Bulletin

PERFEX

PERFEX GAGE & TOOL CO.
123 AVERY ST. • MT. CLEMENS, MICH.

7226

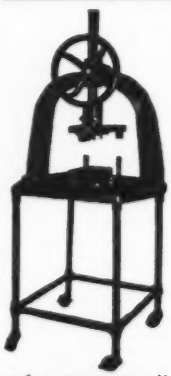
CIRCLE INFORM-A-GRAM KEY NO. 2121

DYKEM STEEL BLUE
Stops Losses
making Dies and Templates
Popular package 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.
Write for sample on company letterhead
THE DYKEM COMPANY
2303L North 11th St. • St. Louis 6, Mo.
With DYKEM Steel Blue
Without DYKEM Steel Blue

CIRCLE INFORM-A-GRAM KEY NO. 2122

Precision-Made
FIXTURE CLAMPS & DETAILS
Heat-treated and Corrosion Resistant
QUICK SERVICE
CATALOG AVAILABLE
HARCO ENGINEERING

12092 Woodbine Detroit 39, Mich.
Telephone KEnwood 3 7799



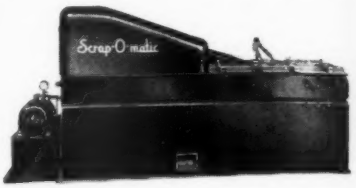
COMPLETE THE DIE-SET AT YOUR BENCH

Lacey Die-Set Machine

Here's a truly "one man" press. It operates with one hand. Handy for tool and press rooms, it permits the diemaker to complete a die-set at his bench . . . saves toolroom and handling costs. Ask today for full details.

Sole Distributors
MOORE SPECIAL TOOL CO., INC.
726 Union Avenue Bridgeport 7, Conn.

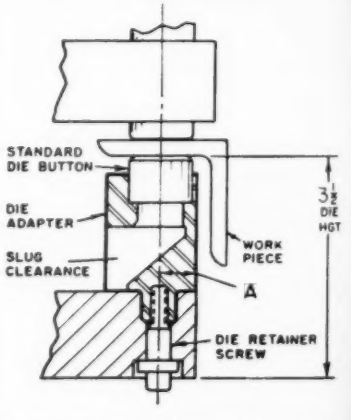
A Lightweight Scrap Metal Baler hydraulically compresses scrap metal and trimmings into uniform 12 x 12 x 12" briquettes for easy handling and transportation. The "Scrap-O-Matic" metal briquette baler requires only 48 sq ft of space. Its



charging compartment will take up to 54" lengths of 24 gauge or lighter metal, or steel wire ranging up to 16 gauge. Balemaster Div'n, East Chicago Machine Tool Corp., East Chicago, Ind., or — **Circle No. A48.**

New "Diadem" Diamond Powder Compounds are made up of selected diamond particles held in permanent viscous suspension. They're packed ready-to-use in unbreakable polyethylene tubes. The tubes each contain 5 grams of the compound and are marked to show the micron size. The micron size of the diamond compound can also be identified by its color. Seven standard micron ranges are available. Whittaker, Clark & Daniels, Inc., 260 W. Broadway, New York 13, or — **Circle No. A49.**

A "Unipunch" Die Button Adapter for hole punching units will punch sheet material and permit hole location close to the leg of angles. Once it is installed, low cost "Unipunch" button dies can be easily removed for sharpening and when changing die size without disturbing



the setup. The adapter's large bottom area provides greater bearing surface to eliminate penetration into the holder base when punching heavy metal. Bulletin 13 from Punch Products Corp., 3800 Highland Ave., Niagara Falls, N. Y., gives complete information, or — **Circle Inform-A-Gram No. A50.**

Powered by the press ram... independent of the die

2 SIZES Cuts steel up to 1/16" thick

3" WIDE $69 6" WIDE $95

Guaranteed — money back if not 100% satisfied

New LOW prices on the JACO AUTOMATIC STOCK REEL

WRITE FOR FULL DETAILS TODAY!

Dealer Inquiries Invited

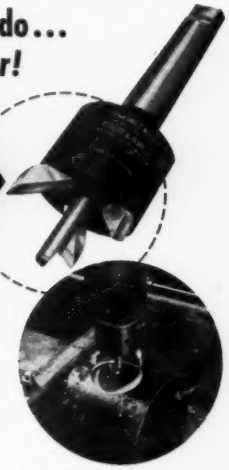
JACO DEVICES, INC.

96 HIGH STREET • HINGHAM, MASS.

CIRCLE INFORM-A-GRAM KEY NO. 2131

Does jobs no drill can do...
Does many jobs *better!*

Clark "HOLE-MAKER"



Produces round, true holes in CASTINGS, FORGINGS, BOILER PLATE, THIN SHEET STOCK, PIPE, TUBING, ETC.; Drills CROWNED, CYLINDRICAL, FLAT OR WEBBED SURFACES!

No triangular shaped holes, no grabbing on break-throughs, no "walking" on starts with the Clark "HOLE-MAKER"! Produces full-gauge holes from start to finish. Removable pilot guides HOLE-MAKER straight and true even on intermittent cuts. Will also use pilot drill.

Ideal production tool on TURRET LATHES, CHUCKING MACHINES, RADIAL DRILLS, DRILL PRESSES, PORTABLE ELECTRIC and PNEUMATIC DRILLS. Excellent for rough boring, finishing and trepanning. Cuts all ferrous and non-ferrous metals and other materials. Saves money, replaces large drill inventory... Bores castings, forgings, etc. 3 to 10 times faster than single pointing!

5 ADJUSTABLE SIZES COVER I.D.'s from 1" to 6"

Specify straight shank or MT 2, 3, 4. Other tapers on order.

MODEL	CAPACITY
102	1"—2"
203	2"—3"
304	3"—4"
405	4"—5"
506	5"—6"

When ordering, specify material to be cut.

ROBERT H. CLARK COMPANY
9330 Santa Monica Blvd., Beverly Hills, Calif.

CIRCLE INFORM-A-GRAM KEY NO. 2133

ULTRA-CHEX GAGE BLOCKS

for Every Need!

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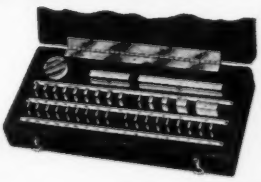

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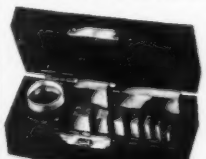

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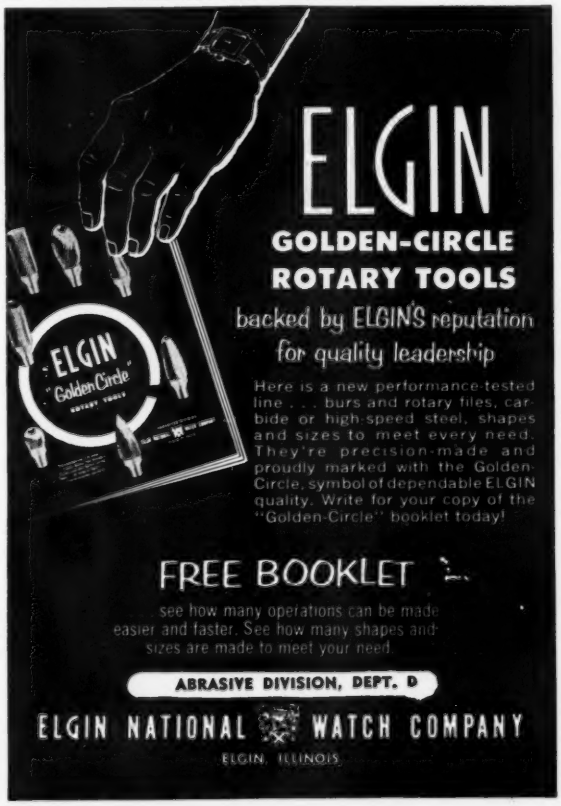
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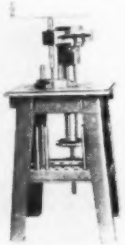

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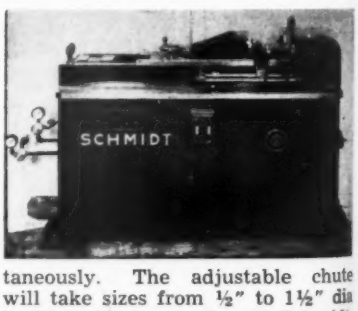

taneously. The adjustable chute will take sizes from ½" to 1½" dia by 3" to 12" long. Geo. T. Schmidt, Inc., 4112 Ravenswood Ave., Chicago 13, or — **Inform-A-Gram No. A53.**

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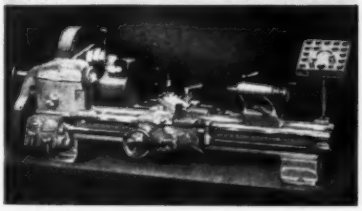
9" BENCH LATHES

LIGHT TEN BENCH LATHES



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.0001"

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DEKA-BORE (and only DEKA-BORE) can be adjusted in fractions of 1/10,000" on the full diameter as easily as reading 1/16" on a steel rule. NOT A VERNIER OR SCROLL ADJUSTMENT. Can be calibrated in increments of .00005 on radii or .0001 on diameter as easily as picking up .002 on a conventional micrometer dial.

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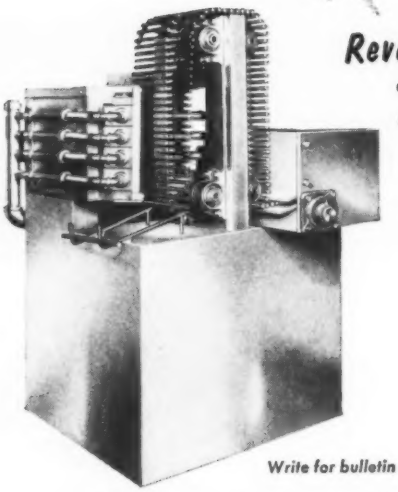
The Automatic G.A.S. "Hot Rod" End Heating Unit



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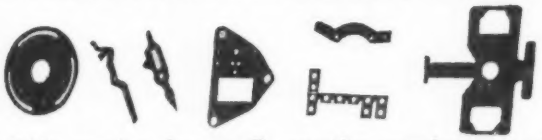

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— Except Screw Machine Cams —

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Design Assistance Offered

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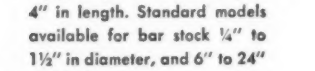

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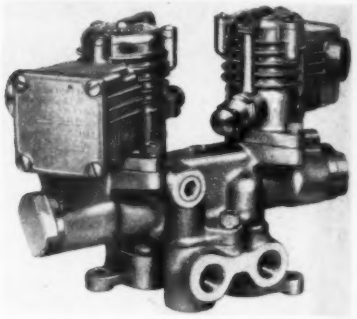

fully inclosed so that the unit is moisture and dust-proof. The valve shown has optional manual override and integral junction box. Valvair Corp., 454 Morgan Ave., Akron 11, or — **Circle Inform-A-Gram A54.**

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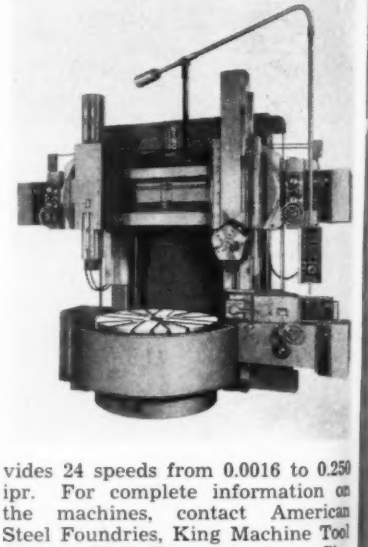

vides 24 speeds from 0.0016 to 0.250 ipr. For complete information on the machines, contact American Steel Foundries, King Machine Tool Div'n, 1150-Y Tennessee Ave., Cincinnati 29, or — **Circle Inform-A-Gram No. A56.**

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★ **TORQUE LIMITATION** Here—responsibility for exact torque control rests squarely with the wrench itself—not with various operators.

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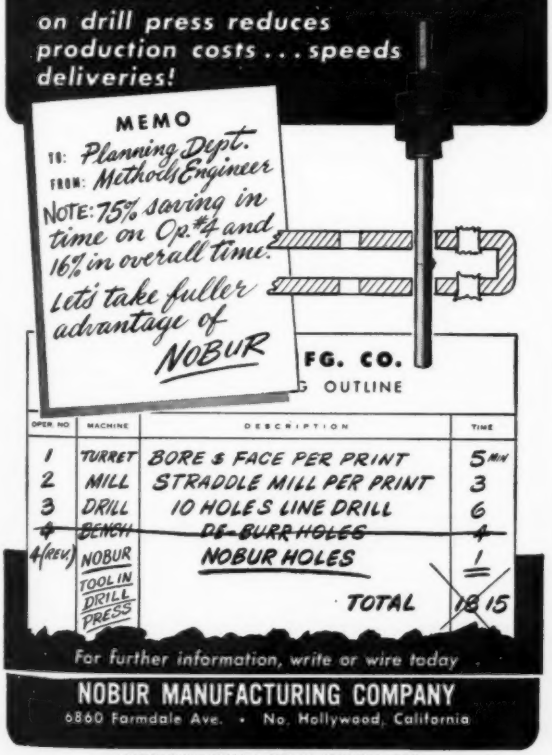
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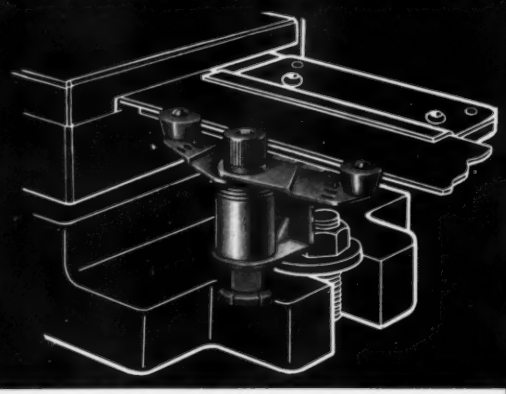

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Rugged...constructed entirely of steel. Rollers, arms, collar and bracket are hardened. Adjustable, three-coil music wire spring.

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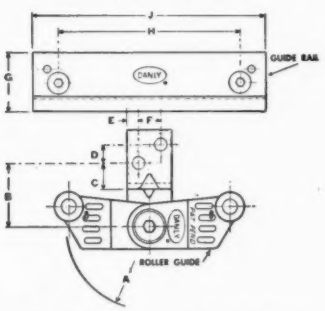

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Danly Roller Stock Guides packed one to a box unassembled, furnished with light or heavy-duty spring for optional use plus all necessary mounting screws and mounting instructions.

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will not crack or peel
Exceptionally easy to read
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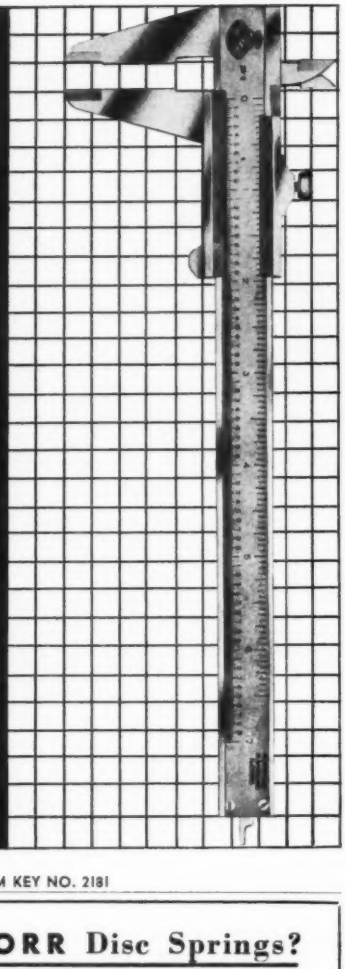

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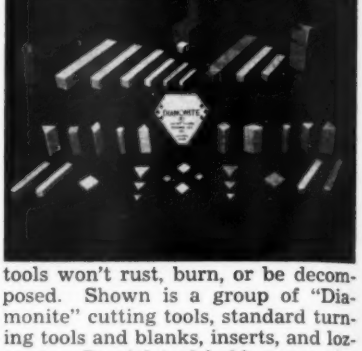

tools won't rust, burn, or be decomposed. Shown is a group of "Diamonite" cutting tools, standard turning tools and blanks, inserts, and lozenges. Special tool holders are also available. Complete details are found in a catalog and handbook from Diamonite Products Div'n U. S. Ceramic Tool Co., Canton 2, O. **Circle Inform-A-Gram No. A57.**

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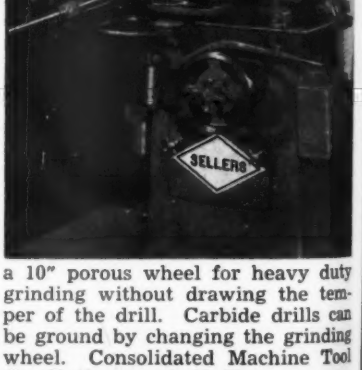

a 10" porous wheel for heavy duty grinding without drawing the temper of the drill. Carbide drills can be ground by changing the grinding wheel. Consolidated Machine Tool Co., Rochester 10, N. Y., or — **Circle Inform-A-Gram No. A59.**

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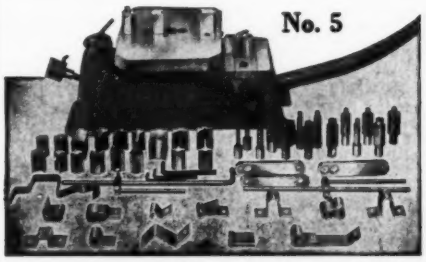

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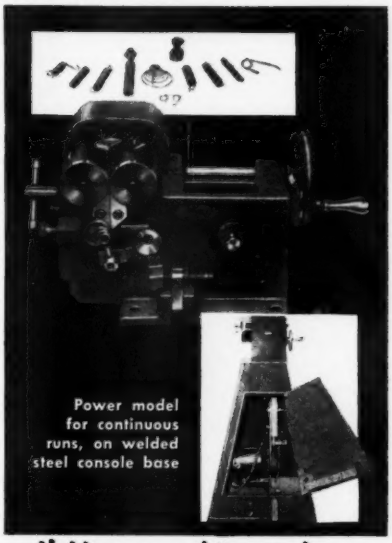
When you need a replacement or experimental spring, any shape, diameter or pitch from flat or round wire sizes .005" to .125", you can produce it in a matter of seconds with the new Perkins Precision Spring Coiler! You entirely eliminate the use of arbors, yet turn out precision springs — torsion, compression, extension tapered, or special springs — coiled either left or right hand, in any desired length, any diameter from 1/16" to 12" and larger, with or without initial tension, and with open or closed ends. Eliminate expensive special orders and costly production delays! Make your own springs to exact specifications for replacements or experimental work. Make them fast right in your own shop!



Power model for continuous runs, on welded steel console base

Only 7" high, OMNI-VISE is lowest in the trade.

Hold any machine work at any EXACT angle with sturdy OMNI-VISE!

Accurately set in all three planes in only 15 seconds, this sturdy precision vise made in two capacities saves time and headaches for progressive shop operators and pays for itself quickly. Only 7" high (lowest in the trade), **OMNI-VISE** #4, shown at top, is tough, weighs 74 lbs. Jaws are 4" x 1½", open to 4". Base is 9" in diameter with one side straight. Inset shows **OMNI-VISE** #2, a precision low-priced vise. Users find it exceptional for grinding compound angles on carbide tools. Weight, 16 lbs. Height, 4¾". Jaws, 2⅛". Opening, 2⅛". Base, 7¼" x 5". For grinding, drilling or general work at any angle, by hand or machine, an **OMNI-VISE** is the machinist's choice.

EXCLUSIVE DISTRIBUTORS OF PRECISION MACHINE TOOLS

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CONNORS AND DAVIS Sales Corp
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Please send detailed information and prices on:
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OMNI-VISE #4 ☐ #2 ☐
Name_____Title_____
Company_____
Address_____
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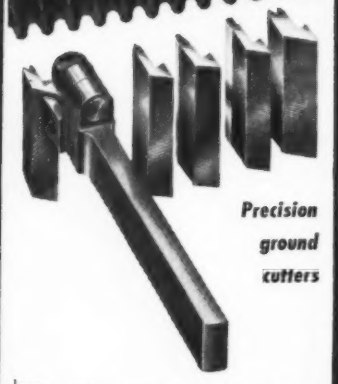
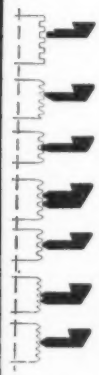
CIRCLE INFORM-A-GRAM KEY NO. 2194

REDUCE THREAD CUTTING COSTS WITH NEW "ST" THREADING TOOLS



Precision ground cutters



Any Standard or Special Thread Form can be cut more precisely and economically with type "ST" Threading Tools.

We supply *long-life super HSS cutter* blades precision ground to any thread form. To resharpen these cutters only grind top face.

Type "ST" *Spring and Swivel* Threading Tool holders come in 4 sizes to fit any standard toolpost. This is the most dependable Toolholder for cutting a smooth Precision Thread and for easy adjustment of angle of lead.

We also carry a full line of *internal* threading tools.

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with . . .

MEEHANITE METAL INSPECTION TOOLS.

They are designed to fill your various Inspection and Checking needs. Sturdily constructed to give you reliable, accurate service.

Surface Plates — Box Parallels
Slotted Angle Plates
Universal Right Angles
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Toolmakers' Knees — "V" Blocks
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Measuring Irons
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ACME TOOL CO.
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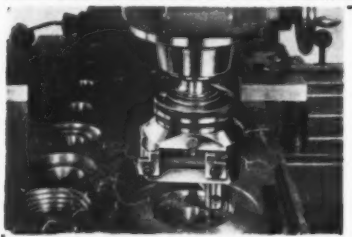

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The Wohlhaupter MASTERHEAD
— IT THINKS FOR ITSELF —
In One Setup and on One Machine . . .

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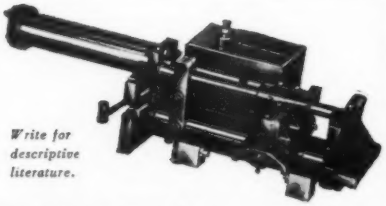
COOPER WEYMOUTH
OPEN THROAT
AIR OPERATED SLIDE FEED
For Power Press Operation

Operates on standard shop air lines. Easy to set up and adjust, holds to extreme accuracy. Made in five sizes. Feeds lengths to 36", up to 18" wide on mechanical and hydraulic presses.



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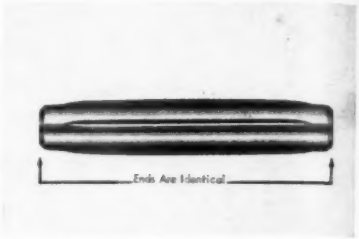
COOPER WEYMOUTH, INC., 277 Noble Ave., Bridgeport 8, Conn.

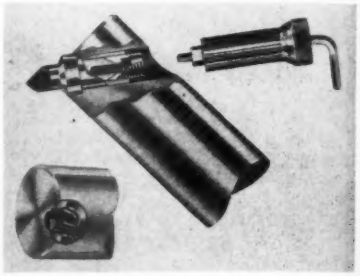
CIRCLE INFORM-A-GRAM KEY NO. 2204

A Self-Locking Pin is designed for hopper feeding and/or insertion in a drilled hole. Type U self-locking "Driv-Lok" pin features a pilot on each end for fast insertion and accurate starting of either end. It is



used as a substitute for taper pins in keying sprockets, gears, collars, knobs, handles, levers, and wheels to their shafts. Driv Lok Pin Co., Sycamore, Ill., or —
Circle Inform-A-Gram No. A60.

The "Sure-Bore" Boring Bar Cartridge is a low-priced micrometer adjustable cutting tool with positive positioning, rigid clamping, and no backlash in either direction. With this tool, it is simple to make boring



bars, face mills, fly cutters, and other cutting tools requiring precision adjustment. Portage Double Quick Tool Co., 1046 Sweitzer Ave., Akron, O., or — **Inform-A-Gram A61.**

Eliminate Pressure Variables encountered in square gage block assemblies by using a new torque screw driver. It is to be used after the blocks have been cleaned and wrung by hand. With this torque screw

driver it is possible to get consistent repeat accuracy in assembling stacks of the same dimension because it "slips" at a fixed torque. The DoAll Co., Des Plaines, Ill., or —
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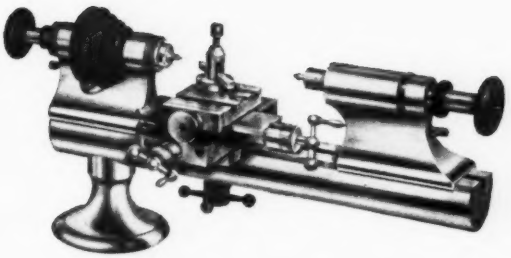
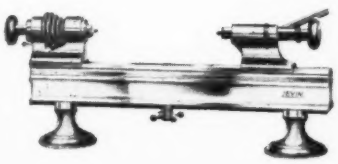
ARE YOU DRIVING TACKS WITH A SLEDGE HAMMER?

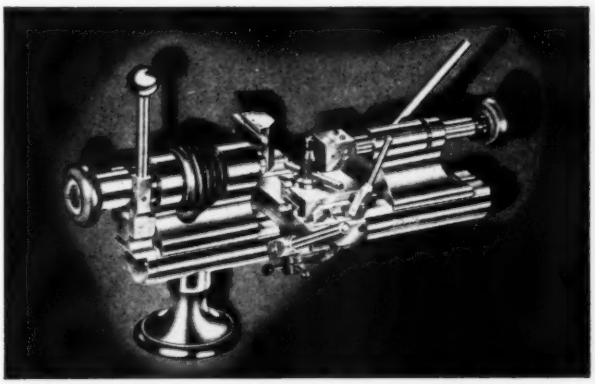


SMALL PARTS ARE MADE WITH GREATER ACCURACY • ECONOMY • SPEED ON *LEVIN* INSTRUMENT LATHES

For efficiency small work should be done on a small lathe. In many cases the work done on an instrument lathe requires a degree of precision and fine finish which cannot be obtained from larger machines. LEVIN lathes are made in two collet capacities, 5/16″ or 3/16″, and thirty-three different models.



Send for Catalog M describing complete line of instrument lathes and accessories. Louis Levin & Son, Inc., 3610 S. Broadway, Los Angeles 7, California.



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unexcelled for wear resistance

Bryant Granite Surface Plates are finished on the "head" of the grain, a patented process. This feature ensures a long wearing surface of uniform density and durability.

Low in cost, Bryant plates are made from selected fine grain black and white granite and are ideally suited for inspection, layout and assembly work. Convenient stands featuring 3-point mounting for plates are available.

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CAST IRON HAND WHEELS

Solid Web and Counter Balanced. Made of fine grain cast iron. Center hole and faces of hub are true to rim. Rims and handles are ground and polished to high lustre. Adds distinction to product. Top quality. Low prices. Many sizes. Immediate delivery. Alterations when required at nominal prices.

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DIE FILERS . . . for straight-line sharp corner filing, sawing and lapping.

This low cost precision-built unit performs all die making operations at savings up to 40%. Furnished complete with motor and two overarms. No extras to buy.

PROFILE GRINDERS

. . . for high speed Precision Grinding of Curved and Irregular Contours.

Standard features include 20,000 or 30,000 R.P.M., or a combination of these spindle speeds, ½ H.P. motor, Collet Chuck, Compound tilting table, built-in wheel dresser.

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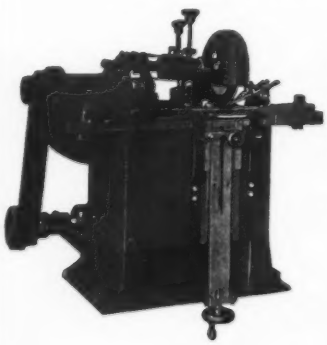
Get Six Times More Service FROM YOUR HACK SAW BLADES

With a Wardwell Model EC

COMBINATION SAW GRINDER



The only single unit grinder adaptable for hack, band and circular saws that does not depend on the shape of the grinding wheel to form the shape of the tooth. This unique feature enables the operator to grind a variety of blades without dressing or changing wheels.

Saws sharpened with Model EC are better than new because they are ground **after hardening,** not before.

Unequalled Accuracy • Simple Operation
Quick and Easy to Adjust Reduces Saw Purchases

Literature Upon Request

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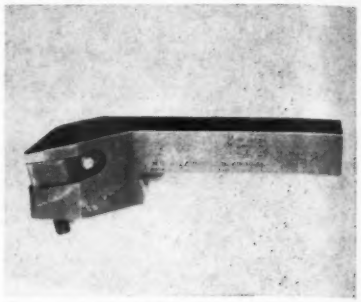
Maker of largest line of saw and tool sharpening machines

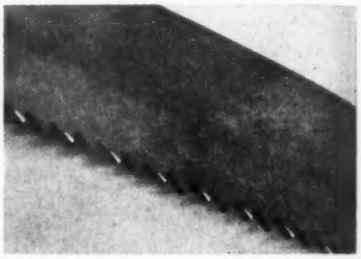
CIRCLE INFORM-A-GRAM KEY NO. 2223

Indexable Carbide Insert Tool Holders for offset machining have been introduced by Wesson Co., 1220 Woodward Heights Blvd., Detroit 20. Either Model GAR or GAL can perform either facing or turning or a combination of both in one opera-



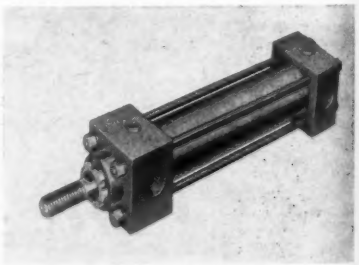
tion. Four sizes are available for either right or left hand mounting. By angling the holder in the tool block 5°, the tool can be used for square shoulder turning or facing without resetting. **Circle No. A63.**

A Power Hacksaw Blade with chamfered teeth improves hacksaw metal-cutting. Many second or milling operations are eliminated by using Atkins "Chamfer-Tooth" blade.



This patented blade features longer life, less breakage, and smoother, straighter cuts. Atkins Saw Div'n, Borg-Warner Corp., Indianapolis 9, Ind., or — **Inform-A-Gram No. A64.**

New Heavy-Duty Cylinders have been announced by Logansport Machine Co., Logansport, Ind. These "Ultra-mation" cylinders are non-rotating, double-acting, square-end cylinders. They're available in 5



bore sizes from 2" to 6" and 5 basic mounting styles — foot, trunnion, flange, clevis, and pivot. Interchangeable covers permit multiple mounting combinations.
Circle Inform-A-Gram No. A65.

New Fluid Feed AIR-HYDRAULIC DRILL PRESS FEED!

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Learn how Mead's new oil-flow principle adjusts feed rate accurately 2 to 60 inches per minute—other superior features. Write factory or nearest Mead Man for folder plus Catalog of Mead units suitable for automation with it!

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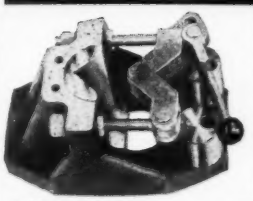
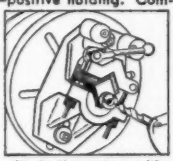
PATHFINDER IN AIR POWER AUTOMATION

CIRCLE INFORM-A-GRAM KEY NO. 2231

LASSY WORK HOLDERS



Quick, accurate setups on lathes, jig borers, milling machines, grinders and drill presses. Normalized and accurate to .0005 in 3 inches. Hold round or odd shapes. Quick acting cam-lock swing clamp for fast loading—positive holding. Complete line of standard accessories includes jaws and clamps for multiple holding and also for use as drill jig. Made in 4 models—capacity to 4 inches. Write for complete descriptive literature.



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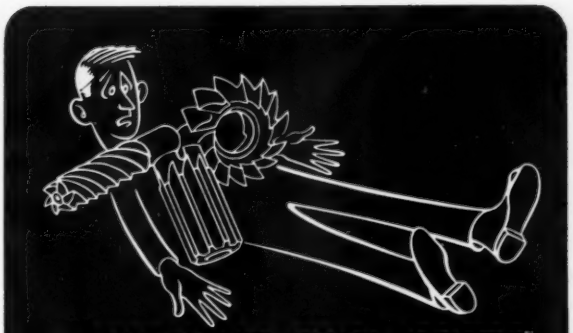

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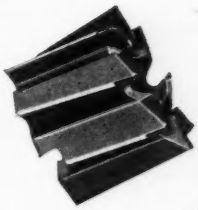

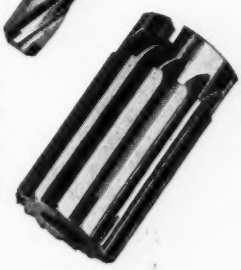

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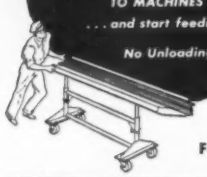
JUST ROLL STOCK TO MACHINES
. . . and start feeding
No Unloading



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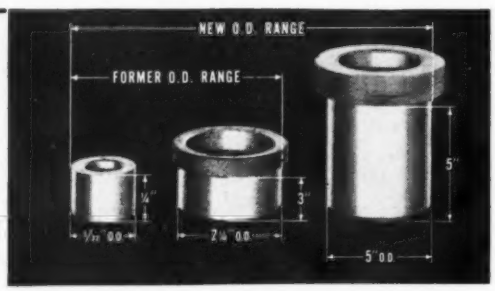

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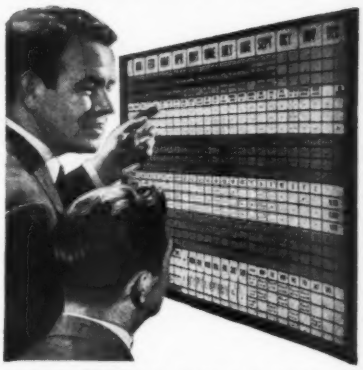

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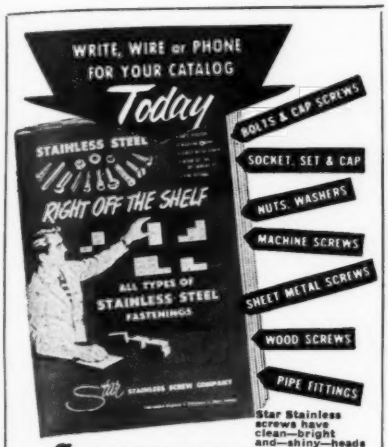

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Done to your specifications
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KIDDE PRECISION TOOL CORPORATION
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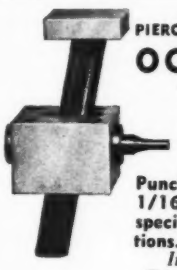

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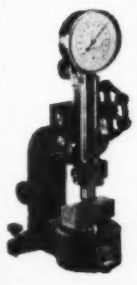
3320 N. Kedzie Ave. -:- Chicago 18, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 2253



HARDNESS TESTING
has been done with the SCLEROSCOPE
Since 1907
THE SHORE INSTRUMENT & MFG. CO., Inc.
90-35 Van Wyck Expressway
Jamaica 35, N. Y.

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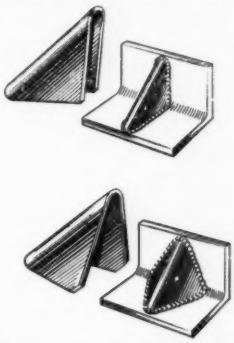
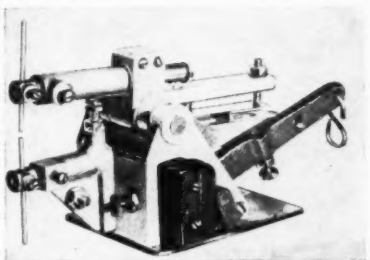
Cut Production Costs while strengthening and improving the structure and appearance of weldments with two new types of formed steel braces. Conner U and V laterally-supported braces assure fuller load support and effortless align-



ment of component parts and eliminate hand finishing. They meet the needs of makers of machine bases, tools, dies, jigs, fixtures, and special machinery. Conner Tool and Cutter Co., Conner Steel Products, 24690 Telegraph Rd., Detroit 19, or — **Circle Inform-A-Gram No. A66.**

A Rotary Table incorporates rotary feed and two cross slides. The Palmgren No. 84 tilting rotary index milling table has an 8"-dia top and can be set at any angle from 0° to 90°. It can be used as an angle plate and for laying out work. Chicago Tool and Engineering Co., 8383 S. Chicago Ave., Chicago 17, or — **Circle Inform-A-Gram No. A67.**

A Single Electrode Welding Head has been developed to handle many small parts hand welding operations. A spring and cam arrangement provides the exact follow-up pressure



instantly to guarantee uniform welds. The unit is operated by pressing a foot pedal. Federal Tool Engineering Co., 1390 Pompton Ave., Cedar Grove, N. J., or — **No. A68.**

Hardened and Ground Blanks with one end "steel mill" soft have been announced by William T. Hutchinson Co., P.O. Box 328, Union, N. J. The soft end has not been hardened and redrawn to a lower Rockwell. This end can be headed, threaded, etc. **Circle No. A69.**

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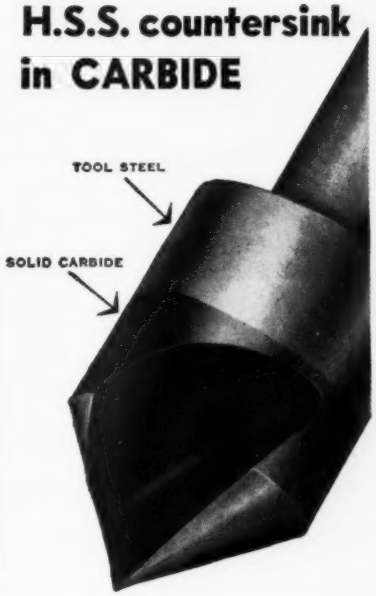
the famous
FORD
UNIFLUTE
H.S.S. countersink
in CARBIDE



Free, smooth cutting features of the Uniflute Countersink are now combined with the high production and long life of carbide. Cuts faster even on hard alloy steels up to 65 R. C. One FORD carbide uniflute covers wide range of holes. 1" O.D. tool effective from 1/16" I.D. to major diameter. Standard sizes 1/4", 1/2", 3/4", 1" — 60°-82°-90°.

Rotary FORD Tools
WRITE FOR NEW FORD BULLETIN NO. 602

M. A. FORD
Mfg. Co. Inc.
817 W. RIVER ST., DAVENPORT, IOWA
Precision Manufacturer of H.S.S. & Carbide Rotary Cutters • Carbide End Mills • Special Tools

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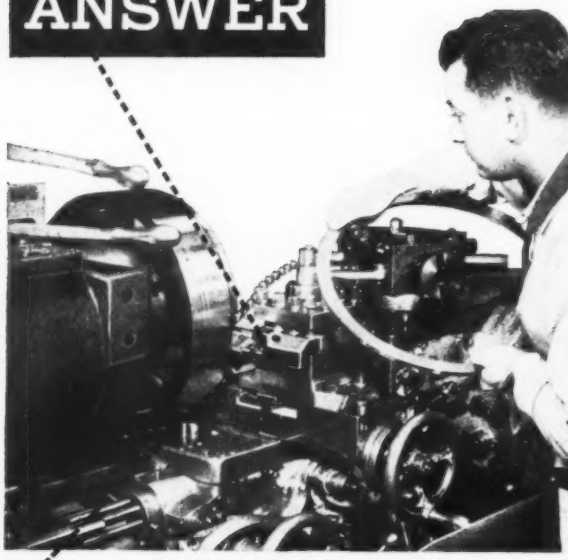
ANSWER



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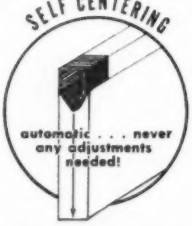
Get maximum production . . . practically no machine down-time . . . on turret lathes, engine lathes, automatics and cut-off machines with PDQ Manchester Cut-Off Tool. Loosen only one screw to change carbide insert . . . "V"-design assures accurate self-centering. Get a faster cut-off with Manchester and save money!



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Carbide Reamers • Form Tools
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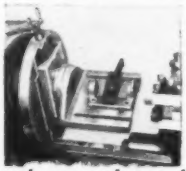

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MICRO-CHUCK
Division, SCOTT-BROWNE CORP.
Batavia Pike • Newtown, Ohio

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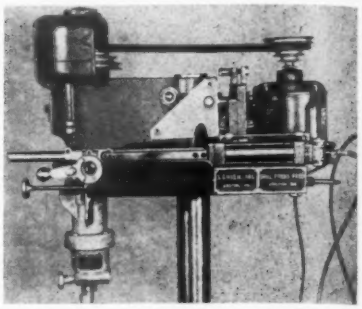
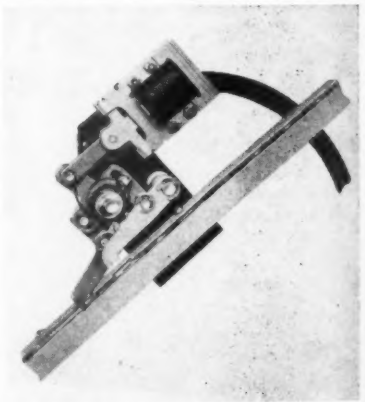
Designed To Be Attached To Any Drill Press, milling machine, or other tool where controlled power is needed to rotate a drive shaft, is a heavy duty press feed. It converts hand operations and controls to semi or completely automatic. Since each



stroke is antomatically controlled by pneumatic power plus hydraulic check at the break-through point, there is more uniform production. Lehigh, Inc., 1500 Lehigh Dr., Easton, Pa., or —
Circle Inform-A-Gram No. A70.

A New Locking Spline Arbor is used to hold the worm gear for turning and hobbing operations. It solves concentricity problems. Its speedy clamping action centers the workpiece concentric to the pitch diameter of the spline. A folder of engineering drawings showing its many applications is available from the manufacturer, Master Spline Tool & Gage Co., 19760 W. Eight Mile Rd., Detroit 19, or —
Circle Inform-A-Gram No. A71.

A Standard Unit for Parts Escapement is now available to manufacturers and design engineers planning installation or conversion to automatic parts feeding. The unit can be attached at any point along the feed track. Spring loaded fin-



gers automatically release the individual parts up to 200/min, one at a time. The escapement fingers can be shaped or formed to take any piece part up to 3" dia. Dixon Automatic Tool, Inc., 2300 — 23rd Ave., Rockford, Ill., or —
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Electronic Induction Hardening, Carbonitriding, Flame Hardening, Heat Treating, Bar Stock Treating and Straightening (mill lengths and sizes), Annealing, Stress Relieving, Normalizing, Pack, Gas or Liquid Carburizing, Nitriding, Speed Nitriding, Aerocasing, Chapmanizing, Cyaniding, Sand Blasting. Laboratory Physical Testing.

THE *Lakeside Steel Improvement Co.*

5418 LAKESIDE AVE., CLEVELAND 14, OHIO HENDERSON 1-9100

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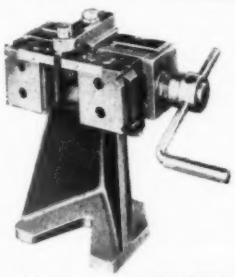
SPEED UP DRILLING & TAPPING JOBS!



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For cross or end drilling round, hexagon, or square stock or standard or odd-shaped rough castings from 1/8" to 8" O.D., the self-centering "John's Drill Jig" will cut tooling and production costs to minimum for 10 to 100,000 pieces.

Standard removable slip fit bushings and holders available to drill center or mean off-center. The self-centering action will hold within .0015" or better regardless of jig wear or piece part O.D. variation. Jigs available in three sizes 6", 8", 14"; jaw openings 2", 3¼", 7½".

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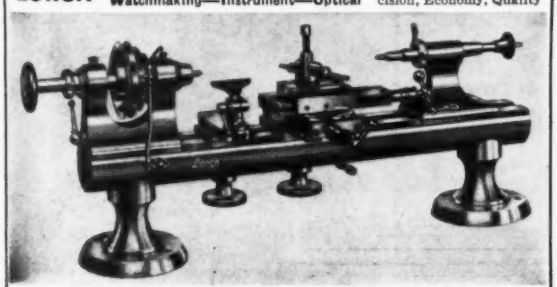
LORCH Small Precision Lathes Watchmaking—Instrument—Optical World famous for Precision, Economy, Quality



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An elaborate assortment of lathes for many purposes. For single parts as well as production. Available with large assortment of accessories such as turrets, thread cutting equipment, multiple tool slides, milling attachments, etc. Tolerance chart will be supplied with literature.

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For DRILLING, CORE DRILLING, ROUGH and FINISHED BORING

The inner race of the GATCO bushing rotates with the tool, piloting the tool accurately below or above the work — or both.

Eliminates expensive tool construction — Reduces tool wear — Prevents seizure and pilot breakage — Especially adapted where precision is required.

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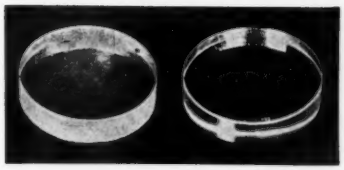
Worn Optical Flats Renewed

Acme Restores Transparency and Accuracy At Savings Up to 40%



Acme's Rehabilitation Service restores worn and scratched flats to original accuracy and transparency at savings up to 40% of the price of a new flat. Fast service.

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For making precision lightwave measurements. Determine surface flatness at a glance, to within millionths of an inch. Visually inspect bores and inside diameters. Easy to use.

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Acme's "SUPER-LAP" Diamond Compounds simplify and speed up roughing, lapping and polishing jobs. Gives a better super-finish on plastic molds, steel, carbides, etc. Accurately graded to NBS specifications.

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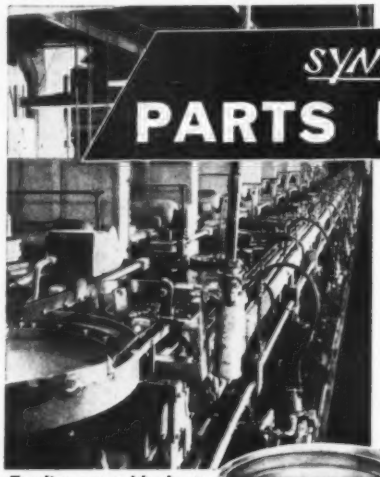
SYNTRON

PARTS FEEDERS



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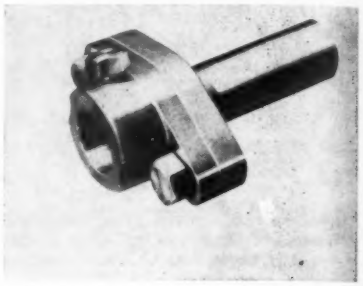
CIRCLE INFORM-A-GRAM KEY NO. 2282

Drill Small, Accurate Holes with Sphinx micro-drills produced by Louis Levin & Son, Inc., 3610 S. Broadway, Los Angeles 7. Left hand and center drills have been added to the company's line. The left hand drills are used on automatic screw machines. "Spirec" center drills are ideal to produce true starting holes. **Circle No. A73.**

A Conventional Floating Holder features a one-piece shank part. It can be used without fear of breakage or need for replacement parts. The holder provides a rapid set-up and a ready means for aligning drills, reamers, and similar tools



with the work. It is recommended for use where the quick change feature of chuck-type holders is not required. Hamilton Mfg. Co., 300 Hamilton St., New Haven, Conn., or **Circle Inform-A-Gram No. A74.**

Large-Size Flame-Hardened Columns for radial drills are now offered by Cincinnati Gilbert Machine Tool Co., 3366 Beekman St., Cincinnati 23. The feature is available on 9" and 11" Gilbert columns as a protection against scoring. Special alloy castings for the 5-ft columns are finish turned, flame hardened, and finish ground to close tolerances. **Circle Inform-A-Gram No. A75.**

A Non-Destructive Thickness Tester is being presented by Unit Process Assemblies, Inc., 61 E. 4th St., New York 3. It gives fast, accurate, direct readings of the thicknesses of nearly any possible coat-

ing on almost any base. It has 4 probes, each corresponding to a different thickness range, and calibrated scales. The instrument can also be used for measuring the resistivity of metals. **Inform-A-Gram No. A76.**

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GUIDE PIN COVERS

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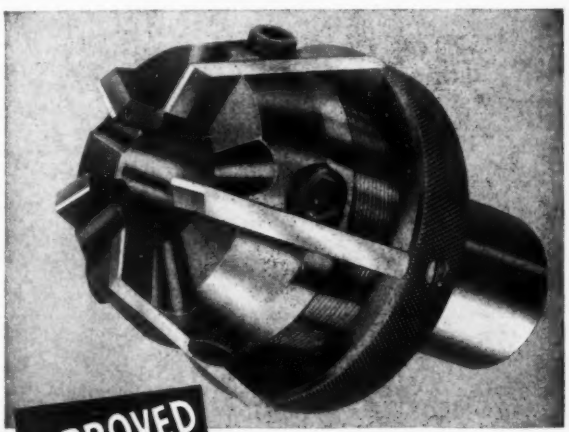

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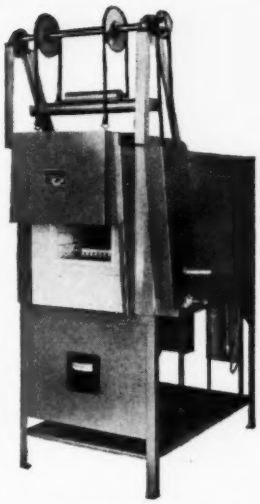
"MULTI-INSULATION" is the secret of...

HUPPERT

Floor Model

FURNACES



These sturdy production type Huppert electric furnaces not only attain highest efficiency, but also cut operating costs to a minimum through the unique Huppert method of using multi-insulation surrounding all sides of the heating chamber. Heat range—continuous up to 1850° F., intermittent operation to 1950° F., can also be built for 2300° F. operation. This furnace comes complete with an indicating electronic temperature controller, and a tight seating, wedge-type door is used. Standardly furnished for 220 V. A.C. single or 3 phase operation. (110 V. or 440 V. models to order.)

This model built in 20 different sizes

Model No. 16 illustrated 12" x 8" x 18" — $1014.00 complete

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ORIGINATORS OF "GROUND-FROM-THE-SOLID" DRILLS

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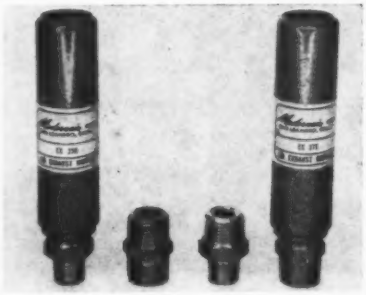
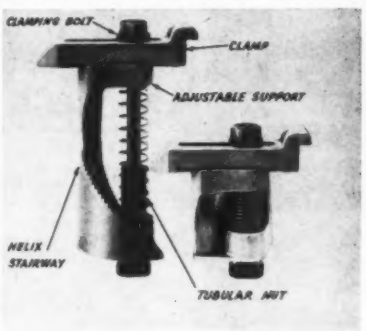


between spacers in a compact cylinder, 31/32" dia and 4-3/16" long. Modernair Corp., 400 Preda St., San Leandro, Calif., or — **Circle No. A77.**

Eliminate Separate Work Clamps, blocks, bolts, nuts, and washers with the new Deckel universal, helix-type work clamp. It provides economical, reliable clamping action on all types of workpieces. By moving



the adjustable support, the clamp can be moved to any height along the helical "stairway". Eleven sizes are available. Cosa Corp., 405 Lexington Ave., New York 17, or — **Circle Inform-A-Gram No. A78.**

The "Ver-T-Bench", an all steel assembly bench, has been produced by The Vince Basnik Co., Materials Handling Div'n, 2020 Center St., Cleveland 13. Detachable trays

hooked to the back of the bench leave the entire table surface free for assembly and tools. The trays have a load capacity up to 500 lbs. **Circle Inform-A-Gram No. A79.**

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with preforms

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5052 SOUTH LAKE DRIVE • CUDAHY, WISCONSIN

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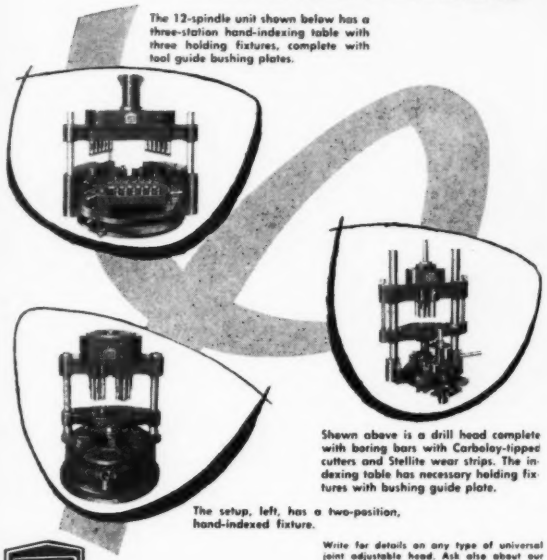
IT'S SAFER TO BUY DRILL HEADS, FIXTURES and BUSHING PLATES AS A COMPLETE PACKAGE



The 12-spindle unit shown below has a three-station hand-indexing table with three holding fixtures, complete with tool guide bushing plates.

Shown above is a drill head complete with boring bars with Carbaloy-tipped cutters and Stellite wear strips. The indexing table has necessary holding fixtures with bushing guide plate.

The setup, left, has a two-position, hand-indexed fixture.

Write for details on any type of universal joint adjustable head. Ask also about our totally enclosed gear-driven adjustable, fixed center, or individual lead screw tapping heads.

US HEADS

UNITED STATES DRILL HEAD COMPANY
616-618 BURNS STREET • CINCINNATI 4, OHIO

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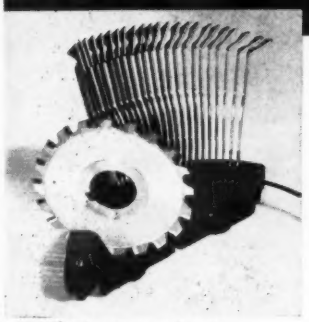
If You Can See It — You Can SAW IT with a GAY-LEE "THINSAW"



Slotting typewriter type bar segment.

Solve problems in high-precision slitting, slotting, sawing with Gay-Lee carbide-tipped Thinsaw! Wafer-thin for the most delicate work with positive alignment and rigidity that avoid run-out . . . but retaining the speed and long life of carbide. Patented construction holds tips firmly.

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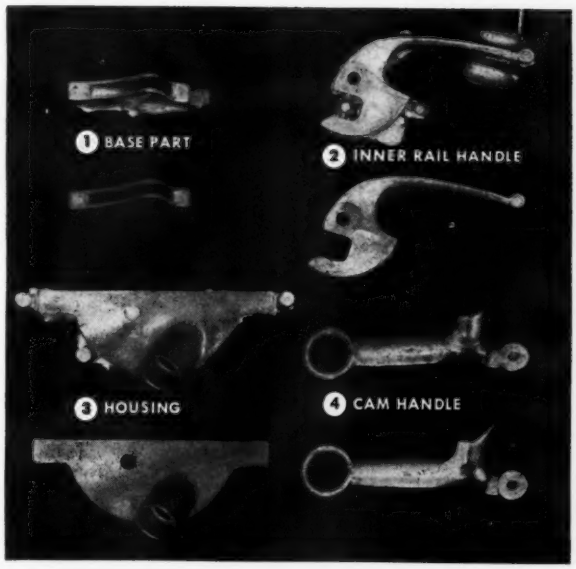

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Minnesota Mining and Mfg. Co.
Dept. MH-26, St. Paul 6, Minn.
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- **Eliminate Costly Fixed Die Sets**
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. . . These cumulative savings result in a substantial lowering of per piece part cost. And, in most cases, Toolset Units permit you to render faster service . . . a bonus feature in better customer relations.

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Start cutting costs NOW
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Zone..... **State**.....

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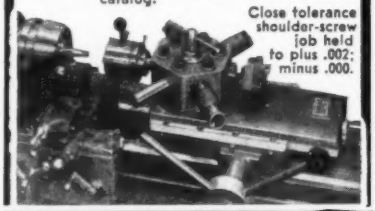
- Assures Equalized Power
- Extreme Accuracy
- Mfgs. most complete line of Lathe Turrets. Send for latest catalog.



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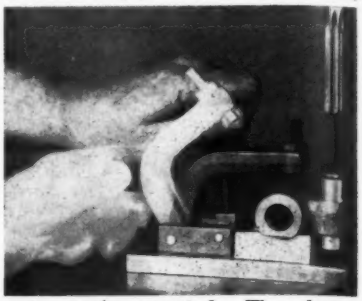
Self - Retracting Work - Holding Clamps have been introduced by Lodding, Inc., Worcester, Mass. The clamps are available in 4 sizes in each of 4 styles — hand knob, cam,



nut, or air operated. The clamps position and clamp in one motion. For high production jobs, the air actuated clamp can be made completely automatic. **Circle No. A80.**

Two New Tools, one for skiving and one for shaving, are used either on single or multiple spindle automatic machines or turret lathes. The shaving tool is designed to hold tolerance of ±0.0001 to ±0.00015". The skiving holder will skive either over or under the work. Smith Tool Co., 10607 Meech Ave., Cleveland, or — **Circle Inform-A-Gram No. A81.**

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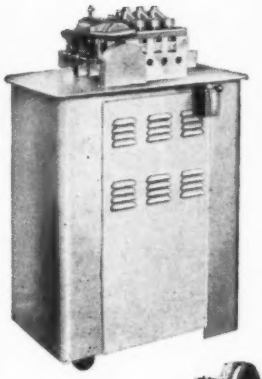
Economy · Dependability



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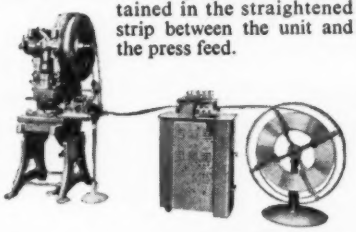
STOCK STRAIGHTENERS

Used in conjunction with a reel stand and automatic feed for punch presses, the Wittek Stock Straightener is a self-contained, motor-driven unit designed for maximum efficiency in the continuous straightening of coiled stock. Standard models handle stock with widths up to 12 inches. An infinitely variable speed drive permits any desired straightening speed so that the proper slack is maintained in the straightened strip between the unit and the press feed.



This typical Wittek automatic production feeding setup includes —Wittek roll feed mounted on the punch press, Wittek stock straightener, and Wittek self-centering reel stand.

5577

Write for full particulars
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HIGH SPEED PRODUCTION DRILLING
OF VERY SMALL HOLES...

is accomplished more efficiently, more economically with a drilling machine specifically designed for this type of work.

Electro-Mechano 8" drill presses include all those features which years of experience have proven to be best for profitable operation in the drilling range of .004" to 5/32".

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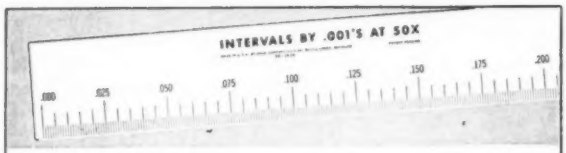

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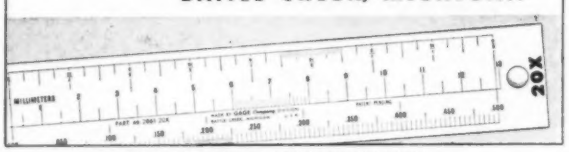

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Inside Story

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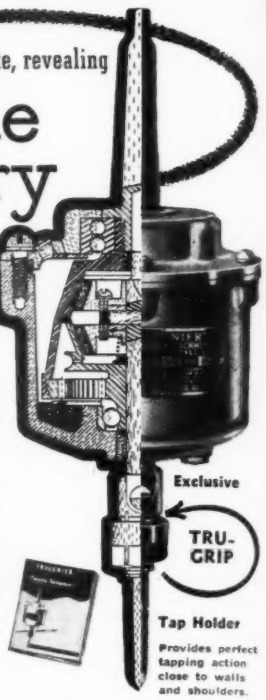

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- Positive gaging accuracy to fraction of .0001" regardless of who operates it.
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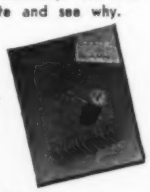

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.0005 HOLE LOCATION IN 3 MINUTES

$10.00 With Case

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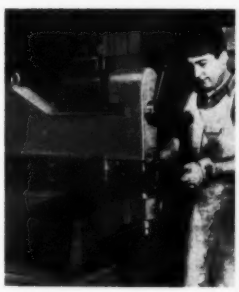

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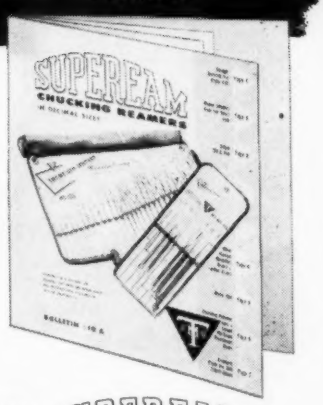

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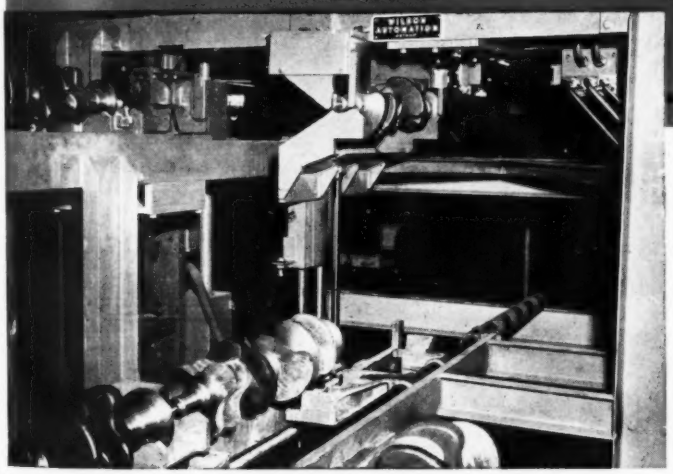
This photo illustrates the typical operational situation. The machine being loaded and unloaded by standard broadside units, which in turn are serviced by the standard lengthwise units. This basic condition is duplicated many times throughout the department. Through electrical interlock, all units are transformed into an organic whole capable of meeting the diverse production needs of the machines throughout the department.

WILSON AUTOMATION

The Wilson Automation Company is a pioneer in the building of Automation machinery. Pictured are two views of one of our latest installations at Plymouth's new engine plant.



A typical corner intersection of the Automation indexing the crankshafts over to a common load station of the lengthwise feed unit and elevator. The parts are transferred over from the second tier and lowered into the first tier ready to be transferred into the next group of machining operations. This type of orientation is typical throughout the crankshaft machining department. The units are hydraulically operated for maximum ease of handling.

We will be glad to discuss with you how Automation can be applied profitably to your specific operations.

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Lamina RING CLAMP GUIDE BUSHINGS

EXCLUSIVE HIGH-STRENGTH DESIGN

Lamina Ring Clamp Guide Bushings are designed expressly for use on heavy duty and bossed dies where large diameter pins are required. Due to the fact that the guide pin contacts the bushing at a point beyond the bearing face of the bushing head, the possibility of the head breaking off is eliminated.

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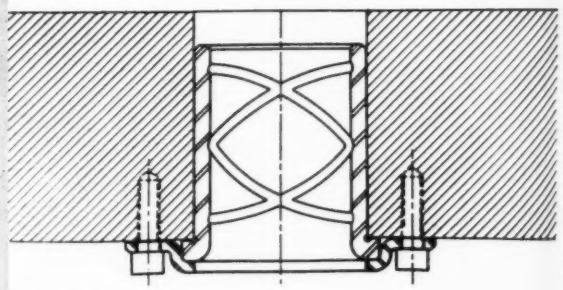
Like all other Lamina Guide Bushings, these heavy duty bushings are assembled with a wring fit in the shoe. Lamina Ring Clamp Bushings also are prefinished by precision honing at our plant. This not only eliminates distortion but saves considerable assembly time, effort and handling of large, heavy shoes.

AVAILABLE IN TWO MATERIALS

Lamina Ring Clamp Guide Bushings are available in both solid Ampco bronze and in hardened steel with bronze plated on the I.D. This latter bushing offers the ideal combination of long wear characteristic of hardened steel and the free-running action of bronze.



★ *In assembly, any portion of the clamping ring may be cut away for clearance if necessary as long as two opposite holes remain for clamping screws.*

★ *A variety of lengths is available in each diameter and each material.*

★ *Rounds out the complete line of Lamina precision guide bushings and pins which are available for every type of die application.*

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